The Electrical Industry's Weekly Magazine November 9, 1959

Electrical World

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Tests Show Savings on A-Plant Containment Shells

Possible Cost Reductions Could Cut Up to 10% of Capital Spending For the Complete Plant

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AIEE FALL MEETING

Reactor Technology Explored for Application to Large Plants

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Special Color Map Shows U. S. Interconnected Systems

Geographical outline of existing power pools and interconnections indicates widespread coverage

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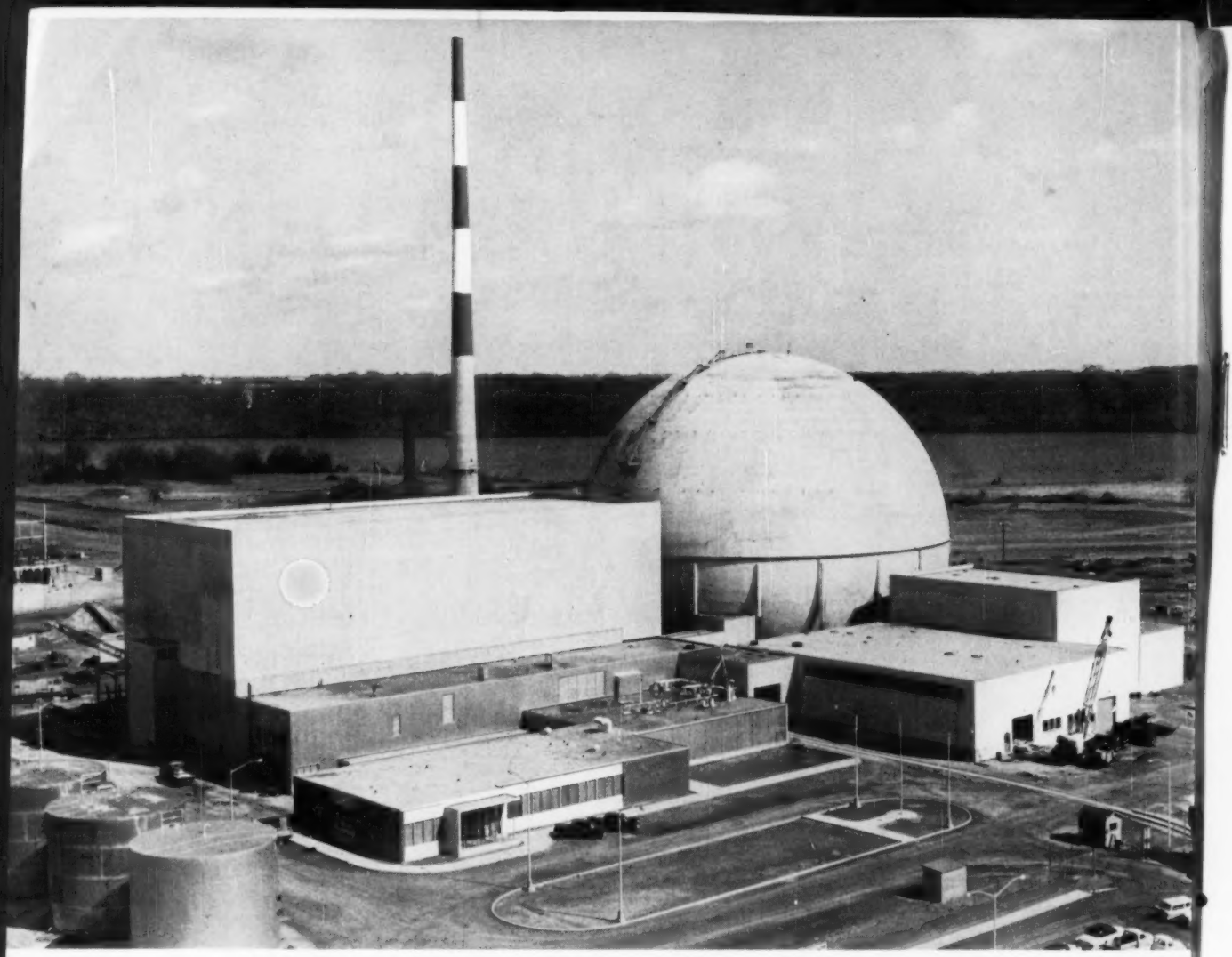
Utilities Appraise Strike's Impact . . . . . p 40

Pros and Cons on Dividend Payouts . . . p 105



Dresden Nuclear Power Station will be owned and operated by Commonwealth Edison Company. It is being built by General Electric Company for Commonwealth and the co-sponsoring Nuclear Power Group.

America's largest all-nuclear power station chooses Texaco Organized Lubrication

In 1960, Dresden Nuclear Power Station will be on the line. It will be the first, full-scale, privately-financed nuclear power station to go into service in the U. S., and has the largest nuclear power reactor of any under construction. From its location 50 miles southwest of Chicago, Dresden will add 180,000 kw to the power supply of the northern Illinois area. And Texaco will be there — as supplier of lubricants for all auxiliary equipment at this great new installation. At Dresden, Texaco will lubricate more than 150 pieces of equipment.

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Electrical World

Vol. 152, No. 19 NOVEMBER 9, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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LETTERS

Fly Ash Market Grows

To the Editor:

I refer to your article "Automatic Pneumatic Handling Speeds Fly Ash to Market" carried in your June 8 issue.

In view of the fact that this article shows sales of 4,100 tons for one plant we think you may be interested to know that our firm in August 1959 sold 669.5 tons in bags and 4,236.25 tons of bulk fly ash produced by (Louisville Gas & Electric's) Cane Run power plant. The September shipments were 579.5 tons bagged and 4,803.18 tons of bulk which in each case was total production of the Cane Run plant.

Walter N. Handy Co
Box 549, Evanston, Ill.

Any news of expansion of the fly ash market is music to our ears.

Gremlins and a Decimal Point

To the Editor:

Thank you very much for the time and energy contributed toward having my article on gas turbines published in the latest issue of Electrical World (EW, Oct. 19, p 62). Your presentation of the article was consistent with your usual high standards.

However, I hope that future clients will not expect to duplicate the one dollar and ten cents per kw installed costs which your sub-heading claims.

F. C. Wallace
Black & Veatch, Consulting Engineers
1500 Meadow Lake Parkway
Kansas City 14, Mo.

To Author Wallace and other careful readers, we apologize. Gremlins with an excess decimal point dropped it in at a most inappropriate place. Fortunately, the correct figure was in the text.

Wants More Info on Yard Pole Cabinet

To the Editor:

We would appreciate detailed information on the yard pole cabinet mentioned in recent article (EW, Oct. 19, p 107). Address of the company was omitted in your article and we are unable to find it.

Walter Wirts
Barton County Electric
Cooperative, Inc
Lamar, Mo.

Name and address of manufacturer is Hi Products, Inc, 7700 Wentworth Ave, South, Minneapolis 23, Minn.

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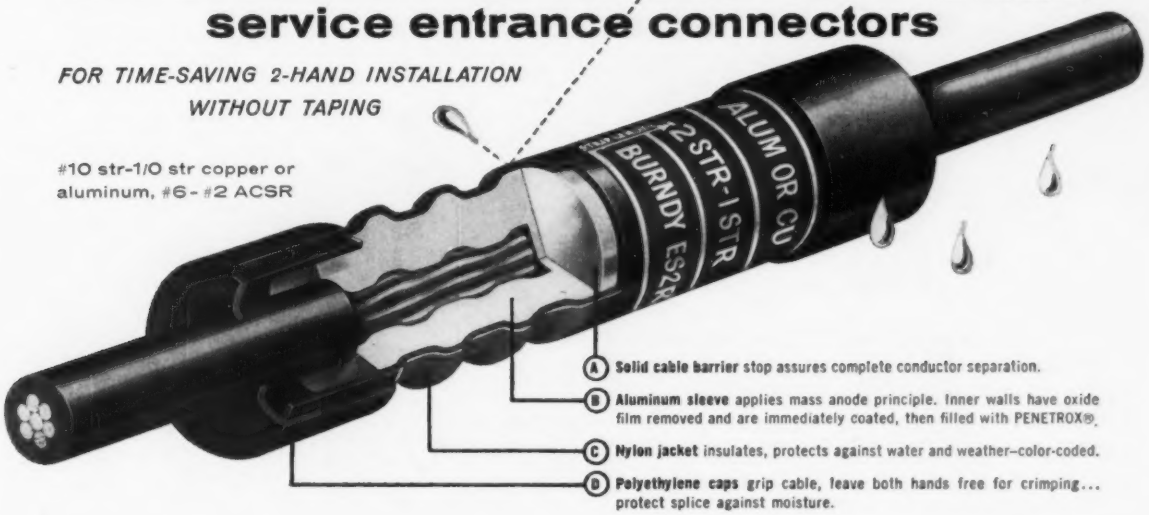

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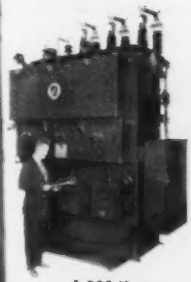
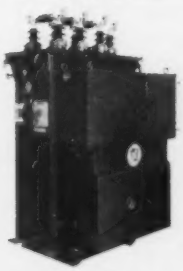
For descriptive information on both single-phase and three-phase regulating equipment, please request our Bulletin No. 81

Phase-Isolated LTC Transformers



1,000 Kva

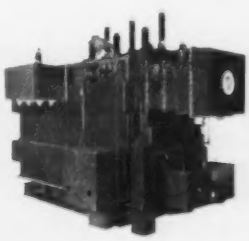
Three-Phase Step Voltage Regulators



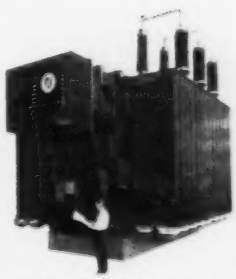
225 Kva

Three-Phase Load Tap Changing Transformers

2500 Kva



50,000 Kva



60,000/80,000/100,000 Kva

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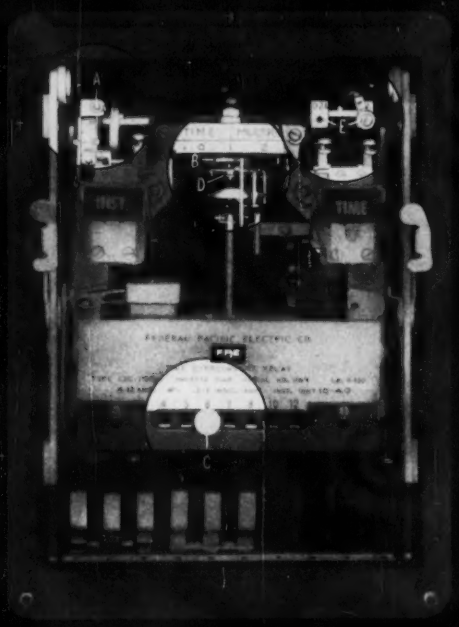

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The Electrical Week

LATE NEWS ▶ **At Atomic Industrial Forum last week:** AEC Chairman McCone pledged continued government support to the industry for the development of reactors for dependable and competitive A-power. Therefore, he said, AEC must place emphasis on those reactor concepts having the greatest promise . . . AEC's Dr Frank Pittman says, on the basis of today's technology, no reactor system can compete with conventional plant using fuel costing less than 54¢ per MBtu, but says six reactor concepts can become competitive in fuel-cost range of 35 and 40¢ per MBtu. Of the six, pressurized water could do it first, he says.

A comparison of 1959 revision of National Electrical Code with that for 1956 has been prepared by NEMA. For copy, write NEMA, 155 East 44th Street, New York 17, N. Y. Cost is 50¢ each.

Around the States . . . East Kentucky Rural Electric Cooperative Corp to build $20-million, 100-Mw generating plant . . . Martinsville, Va., City Council rejects Appalachian Electric's bid to buy city's electric facilities for $5 million.

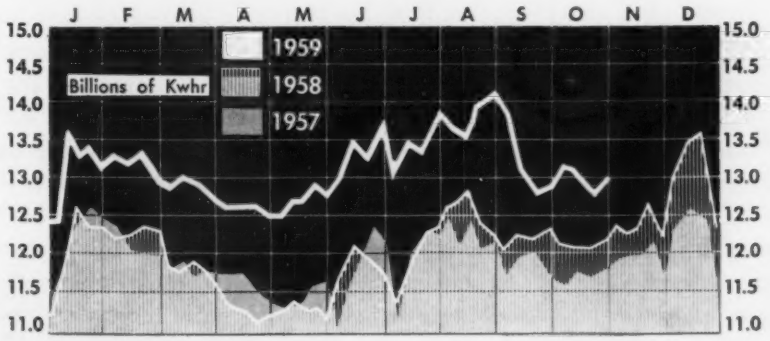
Montana Power-Yellowstone Park contract to be restudied. Reason: General Services Administrator Franklin Floete reports "substantial errors" in calculating earlier cost estimates between company and two competing co-ops to supply the park.

Shippingport starts its first refueling. First elements of the second core were inserted Nov. 2; procedure approaching completion.

Management changes . . . Cleveland Electric Illuminating elects K. H. Rudolph vp-marketing, succeeding R. C. Heinton, who becomes vp in the marketing group.

Obituary . . . Thomas N. McCarter, Jr, 59, retired executive vp and director, Public Service E&G, on Nov. 2 in Wareham, Mass.

WEEKLY POWER OUTPUT—Up 5.3% (Week ending Oct. 31), Kwhr 12,978,000,000



Per Cent Change From Previous Year

	Oct. 17	Oct. 24	Oct. 31
Total U. S.	+ 6.7	+ 4.8	+ 5.3
New Eng.	+ 4.8	+ 3.7	+ 3.2
Mid. Atlan.	+ 6.2	+ 4.9	+ 4.2
Cent. Ind.	+ 5.4	+ 4.0	+ 3.3
West. Cent.	+ 5.9	+ 4.5	+ 6.1
Southeast	+ 6.5	+ 5.1	+ 5.7
South Cent.	+14.9	+ 4.4	+ 9.7
Rocky Mount.	+ 1.9	+ 1.4	+ 4.0
Pacific			
NW	+ 8.9	+ 5.2	+ 4.4
SW	+ 6.6	+ 9.1	+ 9.8

Seasonally Adjusted Index 250.2

Week Ago 248.3 Year Ago 237.8

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **The steel strike is taking a slice of revenues,** but the resiliency of utilities is evident in gross revenue predictions for 1959, EW survey reveals. Bigger problems, though, loom in the form of steel shortages **(p 40)** . . . Unique site is a feature of Southern Electric Generating Co in Alabama **(p 42)** . . . Great Britain expects bulk-rate stability, tougher right-of-way problems **(p 43)** . . . Research gets greater emphasis in gas industry: $15-million outlay seen by 1965 **(p 44)** . . . Most utilities prefer to underplay findings on how good street lighting cuts crime. Those who promote this aspect, however, report good results **(p 45).**

ENGINEERING ▶ **AIEE Chicago meeting heard studies of nuclear reactor designs** with regard to **net cost of power for various types,** all still pointing to economic electric power from such sources belonging to the future. Distribution session was audience for East Coast and Northwestern utility engineers who described new distribution substations which take transmission voltage supply, and coordinated relay schemes for improving distribution-circuit protection against interruptions **(p 47)** . . . Proper communication between property owners and workmen reduce damage claims and complaints due to construction activities along rights-of-way **(p 50)** . . . Detroit Edison shows its low-cost, con-

Politics and Public Power

POLITICS AND STRANGE BEDFELLOWS

Trade associations in Washington are up in arms over proposed new government regulations to bar income tax deductions for many kinds of expenditures long considered tax-exempt. Many of them—often at odds with each other on other issues—will find they are in bed together on this one.

Electric companies will have with them—at Internal Revenue Service hearings Nov. 12-13—a solid lineup of groups ranging from the U.S. Chamber of Commerce to the nationwide AFL-CIO.

The position of the labor unions comes as a surprise. In the past, labor has argued that business shouldn't be allowed to advertise on public policy issues at the taxpayer's expense.

Now they are concerned about the effect the regulations might have on contributors to union funds set up to advance or oppose policy of legislation.

At stake in the fight are millions of dollars now claimed as legitimate tax deductions. Furthermore, the lobbyists and the trade associations see in it a possible threat to their own activities by making it more troublesome and expensive for private companies to support their activities.

Along with the National Association of Electric Companies, IRS will find more than 40 different advertising, trade and business organizations and unions testifying on the new rulings. John T. McDonnell, counsel for NAEC, is on the list of people to be heard, as well as the Advertising Federation of America, and the New York law firm of Reid and Priest.

Hearings on the proposed regulations bring to a head the whole position of the tax collec-

temporary substation design for winning acceptance in residential areas (p 51) . . . Tests at Hennepin Station of Illinois Power affirm that containment shell for BWR plant can be designed for reduced size when cold water in the shell minimizes the pressures of a nuclear incident (p 52) . . . EW presents its four-color map of U.S. interconnected systems and power pools (p 55).

PROCUREMENT & PRODUCTS ▶ **Outlook for the 1960 economy is good**—but with somewhat less forward momentum than this year . . . Wire mills are hard hit by copper shortages (p 74) . . . Maine Public Service installs packaged, push-button-operated, 4,200-kw diesel plant (p 76) . . . Pad-mounted transformers have high and low-voltages—at opposite ends of unit (p 97).

MANAGEMENT ▶ **To pay or not to pay higher dividends** is a multi-million-dollar question in the utility industry. There's no "pat" answer, but here's some background on both sides of the argument, a few generalizations about the relative merits of high dividends and high equity ratio, and a check on how the theories are holding up in today's market (p 105).

SELLING ▶ **EEI will emphasize electric heating,** and woo feminine audience, in its $3 million 1960 Live Better Electrically Program (p 110).

tors as to the meaning of lobbying and advertising. This, of course, has been the bane of the electric companies for years, not only before IRS, but also before the Federal Power Commission in its rate-making role as well.

The IRS ruling states that "expenditures for lobbying purposes, for the promotion or defeat of legislation, or for political campaign purposes (including the support or opposition to any candidate for public office), or for carrying on propaganda (including advertising) related to any of the foregoing purposes are not deductible from gross income."

The new ruling is vague on many points, including the determination of what amounts are considered allowable. IRS says this is one of the roughest issues it will have to rule on. Sources within the agency say that under certain conditions, part of the dues that a company pays to a trade organization may be deductible; the other part for lobbying activities is not. This will have to be determined on an individual basis, according to the IRS.

The present regulations are an updated version revision first proposed in 1956. Until that time, the question of just what is and what is not legitimate advertising for income tax purposes has always been a grey area, but no great issues were created over the matter, and IRS interpretations caused no concern.

What sparked the tougher regulations was first, disclosures in a Congressional investigation of irregularities by the natural gas lobby to secure passage of a natural gas bill in '56, and second, the fuss raised by federal power proponents over the Electric Companies Advertising Program (ECAP).

All of this, then, gives truth to the old and oft-quoted adage that politics makes strange bedfellows. It does indeed.

Nuclear Notes

AEC has authorized the Martin Co's Nuclear Division to build a liquified, fluidized-bed reactor (LFBR) to determine its practicability. The LFBR, long considered promising, is simply a cylinder partly-filled with pea-sized pellets of enriched U238. Water jets entering through the bottom of the cylinder force the pellets up and apart, surrounding them with water and slowing neutrons to splitting speed. Reactivity is controlled by water in the jets. Heat of the reaction turns water to steam. No control rods are required.

Jersey Central P&L and New Jersey P&L, subsidiaries of General Public Utilities, have asked their state PUC to okay participation with Metropolitan Edison and Pennsylvania Electric in building a small experimental nuclear power reactor adjacent to Penelec's Saxton, Pa., generating station. The reactor, to be supplied by Westinghouse, will cost an estimated $6¼ million. Other costs are estimated at $2¼ million. The four utilities, all GPU subsidiaries, will form the Saxton Nuclear Experiment Corp.

Watch for Japan's Atomic Energy Research Institute to complete an $8.6 million purchase of a boiling water type power reactor—most likely from GE—this month. The reactor scheduled to be installed in Tokai, 80 miles east of Tokyo.

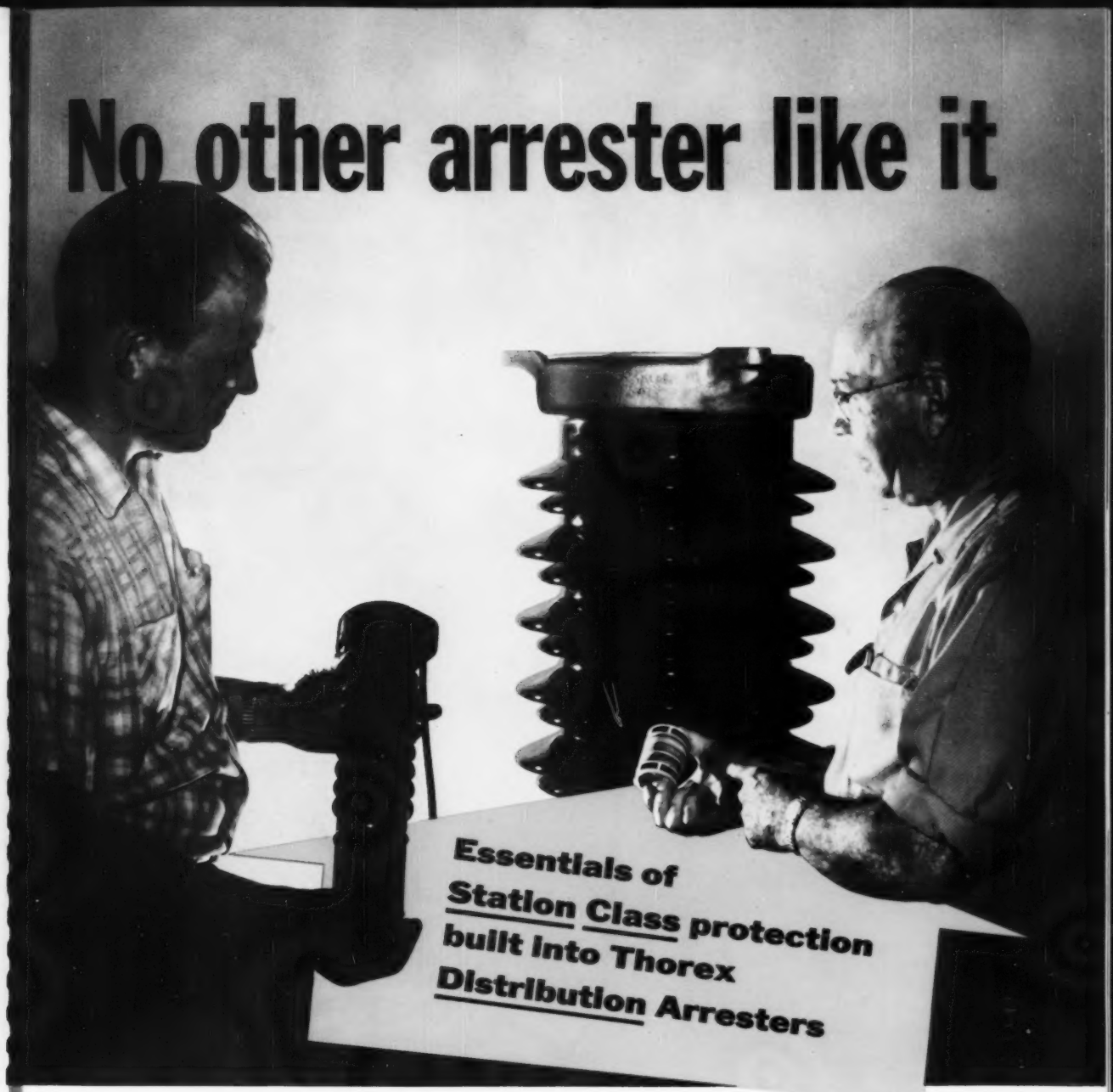
Industrial process heat reactors are making news in the U.S. and abroad. Observers are predicting that process-heat reactors will assume substantial importance in the next decade.

First power reactor designed to produce industrial steam instead of electricity—and also the World's first boiling heavy water reactor—was dedicated October 10 at Halden, Norway by King Olav. The OEEC Halden reactor has been in operation since June 29. It will produce steam at about 71 psi and 150 C at its initial rating of 5 (t) Mw. Ultimately to be 20 (t) Mw, it will produce steam at about 427 psi and 230 C.

In the U.S. Sargent and Lundy will perform engineer-architect services for AEC on a 40-(t) Mw experimental low-temperature process-heat PWR capable of producing saturated steam at from 5 to 175 psig. The steam will be used in a sea-water conversion plant using the multi-stage flash distillation process. The facility is being built cooperatively by AEC and the Dept of Interior at Point Loma, near San Diego.

U.S. development of process heat reactors that could produce steam at up to 600 psi at rates of 100,000 to 250,000 lb per hr was favored by industrial representatives attending AEC's symposium on the subject October 1 at Germantown, Md. Twenty six out of 67 among the 200 industrialists at the symposium, answering an AEC questionaire, are present or potential users of process heat. Most of them preferred development of such reactors as cooperative projects between AEC and industry, with AEC providing R&D assistance and industry contributing to construction cost.

No other arrester like it



Conventional lightning arresters have always been built up to -- or down to -- their intended service. Station, Intermediate, or Distribution Classes had their separate grades of product integrity. *This is not true with the Thorex Dynagap!*

The remarkable Dynagap element, that has brought a revolutionary improvement to the whole arrester art, is interchangeable in every O-B Thorex model -- every arrester class. As a result, the more significant requirements of industry standards for heaviest-duty Station Class are now greatly exceeded by the "lowest-duty" Thorex Distribution Class.

Thorex Dynagap distribution lightning arresters are unique in the degree of service and equipment protection they afford -- also unique in giving you this premium performance without a price penalty.

Four different models fit every line location, and will put a whole new order of safety and durability at each of these points.

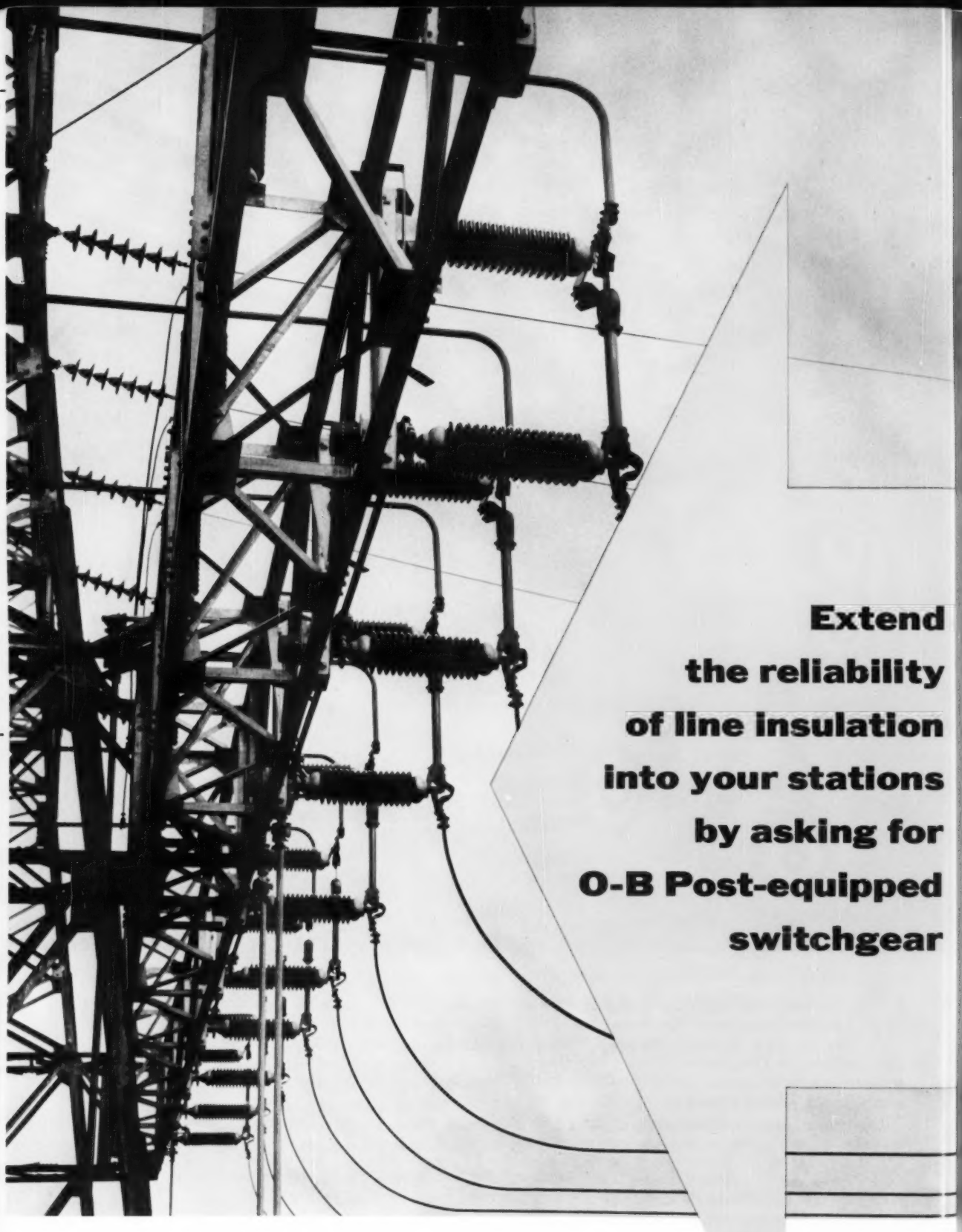
It will have been a good day when you seriously investigate Thorex Dynagap protection for your distribution system.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4926-H1



Extend the reliability of line insulation into your stations by asking for O-B Post-equipped switchgear

Dependability must go through your switches

...it takes just one word..."O-B"...to get your new switches supplied with trouble-free post insulators

Would you build a major transmission line *without ever knowing whose insulators are used?*

That line terminates at a station. It has insulators too -- just as important. Therefore, when you buy switches, is it logical to ignore the make of *their insulation?*

Switchgear manufacturers gladly perform the service of supplying your favorite insulators. It involves no extra trouble or expense. They simply need to know your preference. Getting your choice of insulators is as easy as saying "O-B."

With a generation of know-how behind them, and another generation of trouble-free performance ahead of them, O-B posts will extend the known reliability of your line insulation *into your stations.* And all it takes is just two letters when the switchgear order is placed. Simply say "O-B." Name it and you can have it.

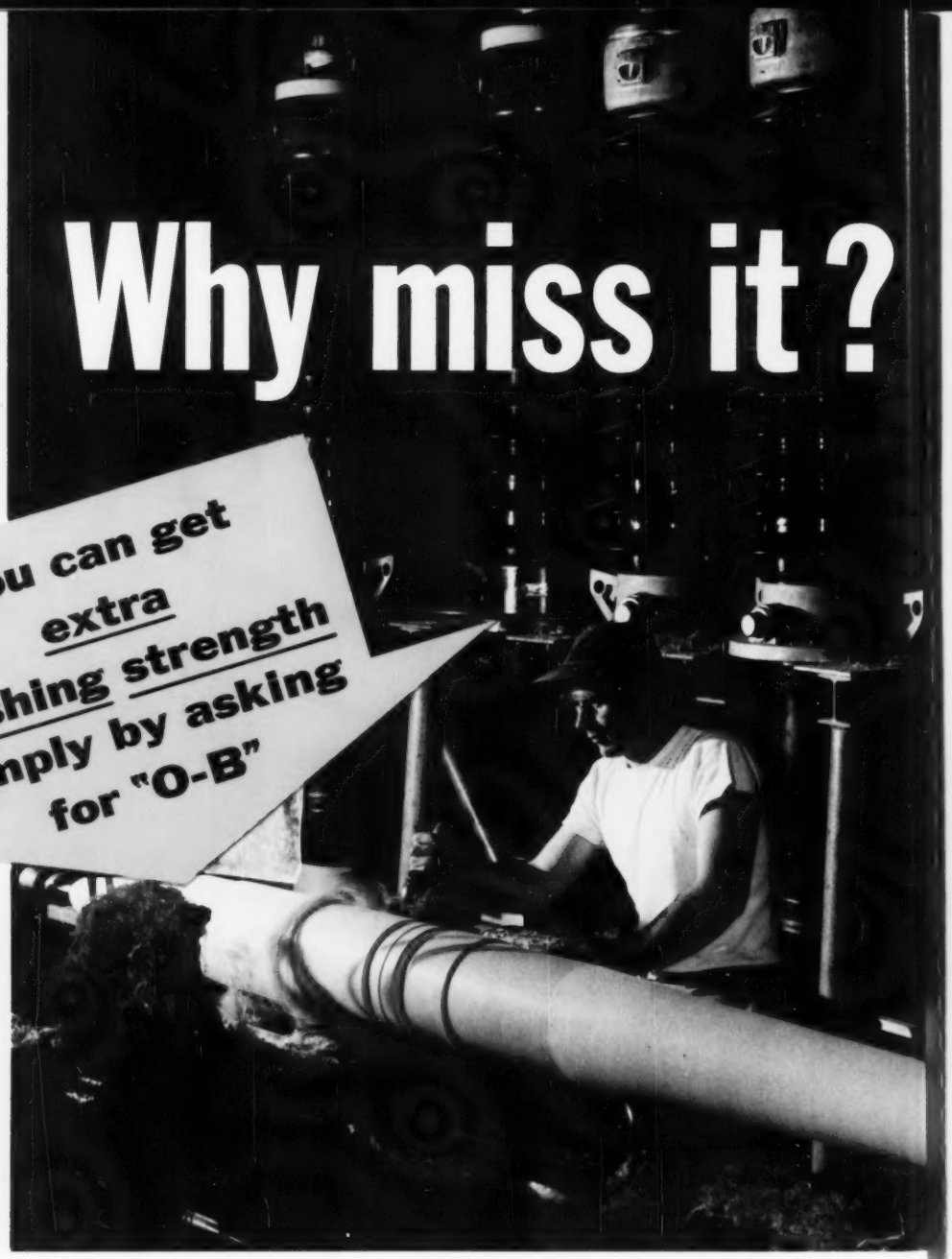
OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass (B) HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4926-H23

Why miss it?



The industry's most modern methods of producing a bushing core impart to O-B's design a unique degree of hardness and strength. These desirable qualities are exploited to produce the strongest bushing in nearly 50 years of manufacturing experience.

Many points of firm contact are established between the core and ground sleeve structure, thereby augmenting over-all rigidity. This is distinctly an O-B construction principle.

Higher physical strength assures safer shipment. It reduces possible damage by careless handling. And then - - in service - - it gives a lifetime of better support for circuit breaker parts, and higher resistance to other strains inherent in bushing application.

Your new apparatus can have O-B bushing protection so easily that you can't afford to miss it. Simply express your choice of bushings when ordering transformers and circuit breakers.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

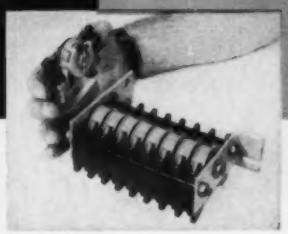
PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

ALLIS-CHALMERS... Pacing Power Progress

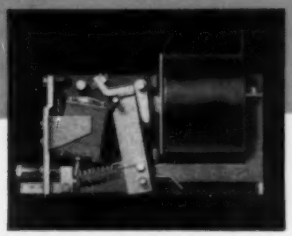
Exclusive electrical and manual stored-energy closing mechanism.

Convenience — control devices located on breaker front—safely available even with door closed.

Safety—*(a)* interlock prevents movement of closed breaker; *(b)* latch prevents rocking past disconnect position.



Flexibility—each stage of auxiliary switch assembly is individually adjustable without disassembly.



Accuracy — direct acting series-trip device is set easily, using calibration scale and adjusting knob.

Plus value in every detail

Allis-Chalmers all-new 600-volt metal-enclosed switchgear for 75,000-ampere interrupting service

Just a few of the operating... safety... and application features of A-C's new design are shown. There are many other features that will interest you, such as unitized construction, the use of polyester glass insulation, and spring-held dust seals.

Get the details! Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-1038-E

ALLIS-CHALMERS

Naugatuck PARACRIL OZO

The oil-resistant, ozone-resistant nitrile rubber

Now! lasting **COLORS** in rubber wire jackets

A development of Naugatuck research makes it possible to combine in a vulcanized rubber wire jacket all these properties:

- Excellent resistance to ozone and outdoor "weathering"
- Outstanding heat resistance
- High abrasion resistance
- Excellent oil, grease and chemical resistance
- Fast CV extrusion

...PLUS PERMANENT BRIGHT COLORS

In addition to the suggested uses, you will think of dozens of other applications where wire jacketing with all these properties can serve either an aesthetic or utilitarian purpose.

One of Naugatuck's technical representatives will be happy to discuss with any prospective user the formulation of the Paracril® Ozo compound which makes possible this combination of properties... not only in wire jacketing but also in shoe soles, hose jackets, weather stripping and other vulcanized rubber products.

Naugatuck Chemical

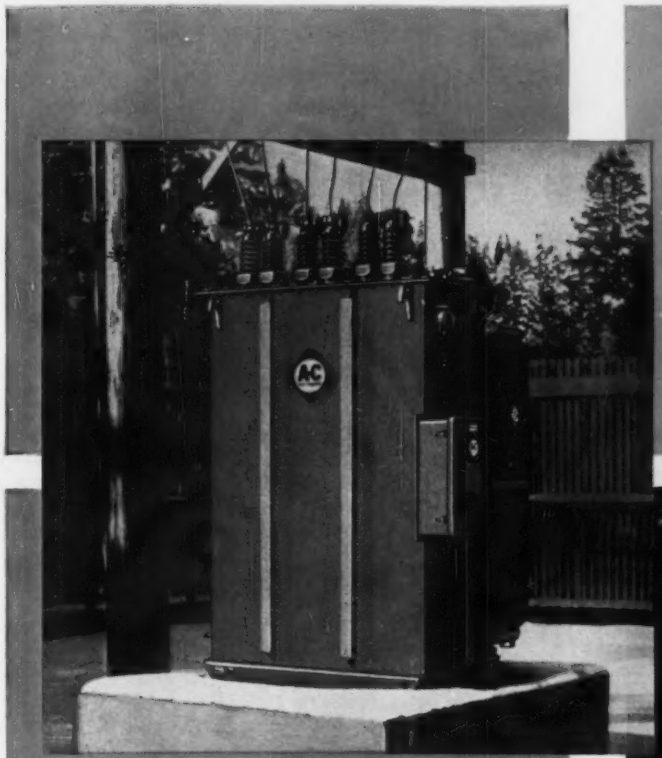
Division of United States Rubber Company

1113P Elm Street
Naugatuck, Connecticut

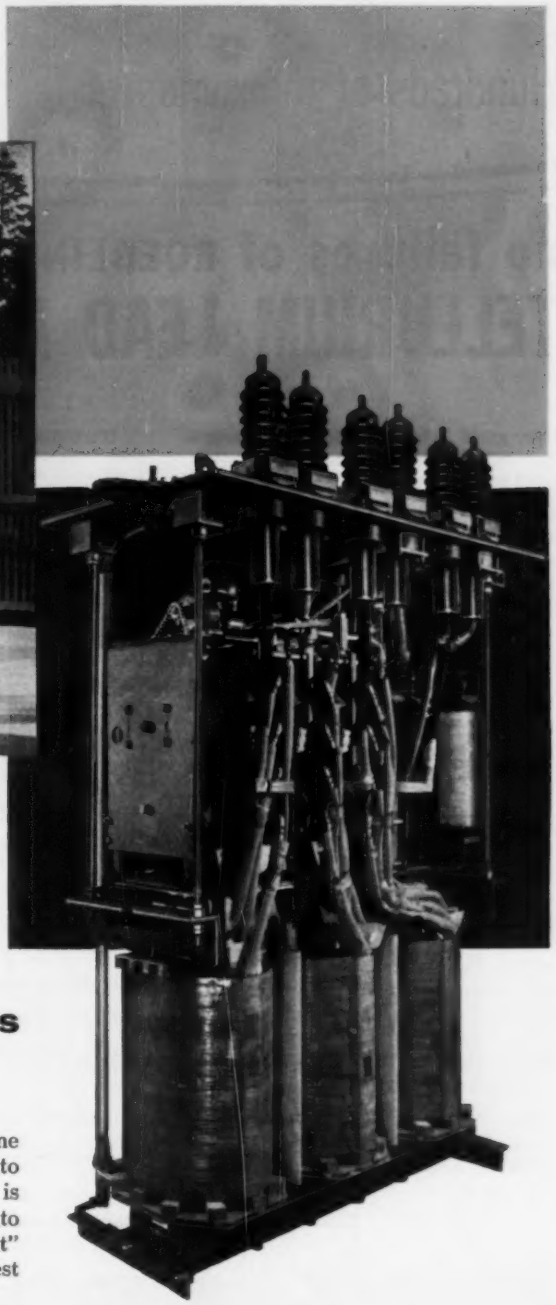
US RUBBER

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario • CABLE: Rubexport, N.Y.

ALLIS-CHALMERS... Pacing Power Progress



standardized components and unit design



why Allis-Chalmers 3-phase regulators

PACK MORE VALUE

Mass manufacturing of standard components — that's one reason why Allis-Chalmers can put so much value into industry's lowest-priced 3-phase regulators. Another key is *unit construction*. Simplified subassemblies are joined into a complete unit. Suspended from the cover, this "lift-out" unit makes interior readily accessible, assures you the best in construction.

More A-C regulator values: *Caliband* control, "Quick-Break" tap-changing mechanism, unidirectional breather and *Vari-Amp* rating.

Originators of 5/8% step regulators

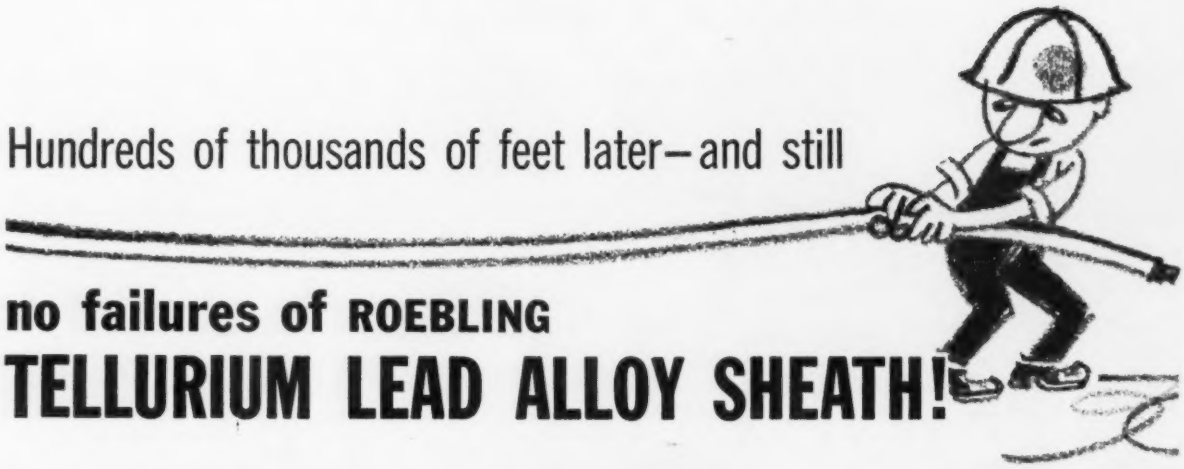
Regulator facts fast! Call, wire or write...

ALLIS-CHALMERS

Caliband and *Vari-Amp* are Allis-Chalmers trademarks.

A-1164E

Hundreds of thousands of feet later—and still



no failures of ROEBLING TELLURIUM LEAD ALLOY SHEATH!

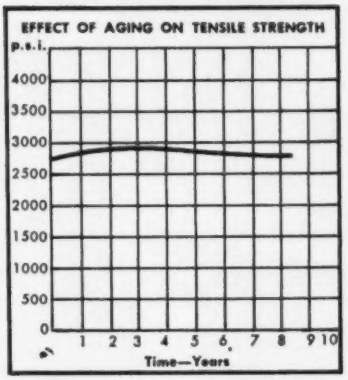
More proof: Tensile strength and elongation remain virtually unchanged, after eight years aging.

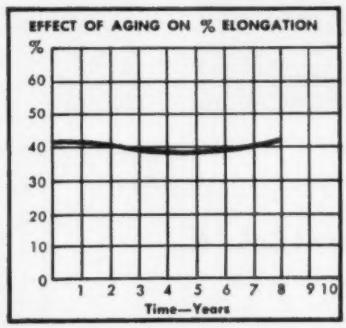
The first Roebling Paper Power Cable with the extraordinary Tellurium Lead Alloy Sheath went into service over five years ago. Since then hundreds of thousands of feet have been put to work. The record? Not a single failure! This remarkable record of service on energized circuits proves conclusively that Roebling Paper Power Cable with Tellurium Lead Alloy Sheath gives you maximum service, with maximum savings!

What's more, we asked the people who bought this cable to put it into the toughest service possible—in such installations as high risers, grades and underground installations where large cable movements and high temperatures prevail. And this gruelling service bears out what we've always maintained: Roebling Tellurium Lead Alloy Sheath has long term stability when it comes to tensile strength and elongation, high resistance to creep and bending fatigue.

These graphs of laboratory tests show effect of aging on tensile properties of Tellurium Lead Alloy Sheath.

TELLURIUM LEAD ALLOY SHEATH...

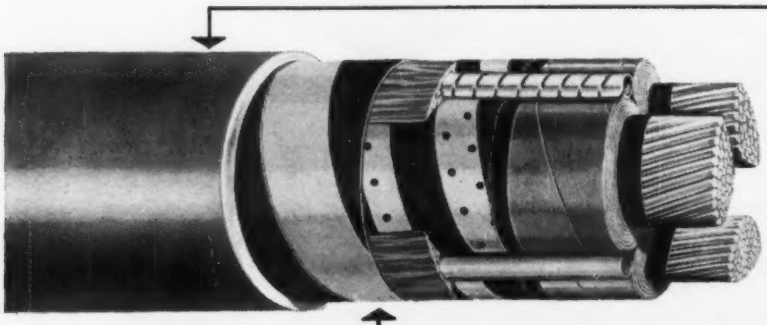




The exceptional quality of this sheath is one reason why Roebling has more Tellurium Lead Paper Power Cable in service than any other manufacturer. *Another* reason is the superb *inner* quality of this cable. Every step of construction represents scrupulous care. The paper tapes, for instance, are applied under uniformly controlled tension, to assure maximum insulation qualities. And every inch of the cable is tested—then tested again.

You benefit in all kinds of savings—not the least of which is *money*—when you put Roebling Paper Power Cable with Tellurium Lead Alloy Sheath into service! Don't you owe it to yourself, and your company, to find out more? An interesting, profusely illustrated book is yours free. Write for your copy ... right now! Ask for Technical Bulletin 205-C. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

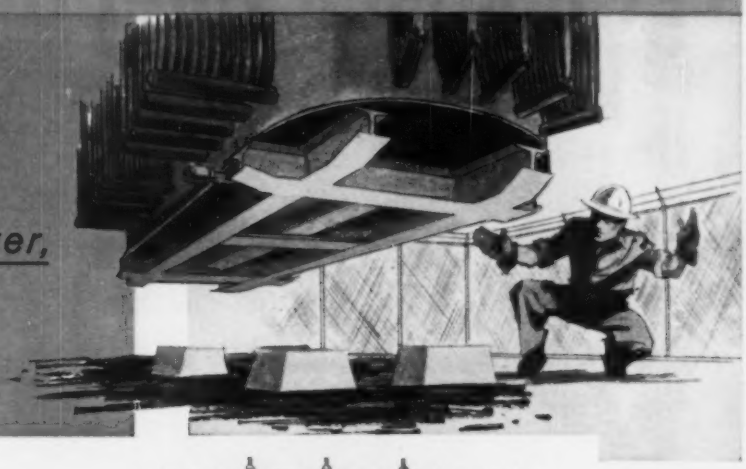


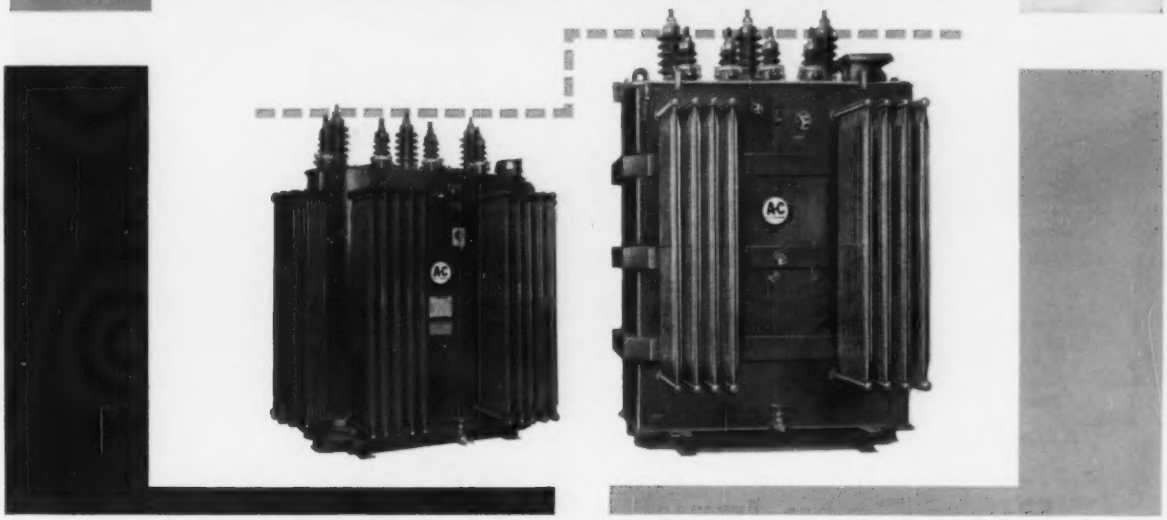
Uniform physical properties are easily achieved in a single operation with the tellurium alloy. This unique feature is but one of several which distinguish the tellurium alloy from other fatigue-resistant lead alloy sheaths.

Mammoth new taping and cabling machines, and the finest obtainable materials, are used to produce the carefully constructed "heart" of Roebling Paper Power Cables.

ALLIS-CHALMERS... Pacing Power Progress

Easier to install because they're 30% lower, lighter too!





NEW

Allis-Chalmers small power transformers

Goodbye to building high-cost foundations — engaging extra-heavy-duty handling equipment — all to install "small" power transformers.

All new — these lighter, lower units by Allis-Chalmers bed down on a thinner pad, low cost piers or concrete planks. Handling is simplified by the weight-saving design. (The 34.5-kv, 3750-kva transformer, for example, has had its weight reduced by 8000 lbs.)

Easier servicing is another basic advantage of this new design that also reduces losses, exciting current and noise level. The unit is reinforced from the inside, offering a smooth, clean appearance — no disfiguring, dirt-gathering external bracing.

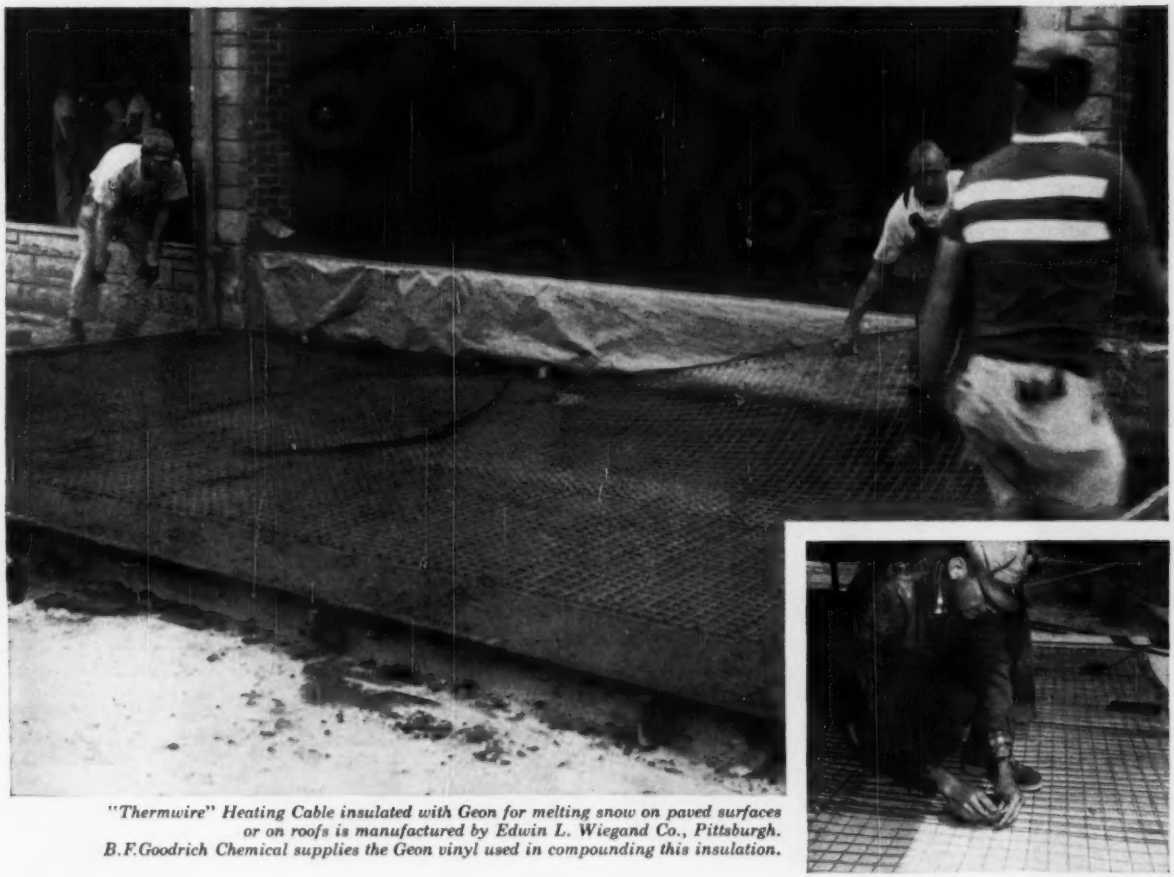
Get the complete story from your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

ALLIS-CHALMERS AC

A-1179-E

Another new development using

B.F.Goodrich Chemical *raw materials*



"Thermwire" Heating Cable insulated with Geon for melting snow on paved surfaces or on roofs is manufactured by Edwin L. Wiegand Co., Pittsburgh. B.F.Goodrich Chemical supplies the Geon vinyl used in compounding this insulation.

Bury Geon-insulated cable by taping to reinforcing wire in concrete

Snow shoveling won't be a problem for these shopping center sidewalks. Heating cable insulated with Geon vinyl is buried in the concrete. 190-foot lengths of cable are taped to the reinforcing wire rolled out between pourings. After the top ¾" layer of concrete is poured, the installation will be a permanent, load-building work saver.

Insulation made from Geon is especially useful for a buried-in-concrete installation because of its unusual resistance to abrasion, aging and most causes of corrosion. Other materials that were tried got brittle with heat—not Geon: it retains its excellent dielectric properties and flexibility.

Here's another way new applications are being developed through use of Geon vinyl. For more information, write Dept. AT-10, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

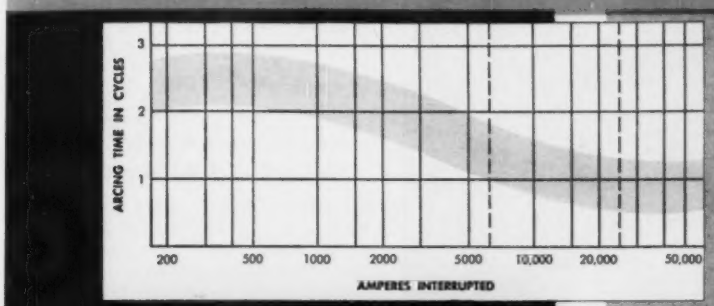
A TRADE NAME OF B.F.GOODRICH CHEMICAL COMPANY
Geon
VINYLS
A DIVISION OF THE B.F.GOODRICH COMPANY

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

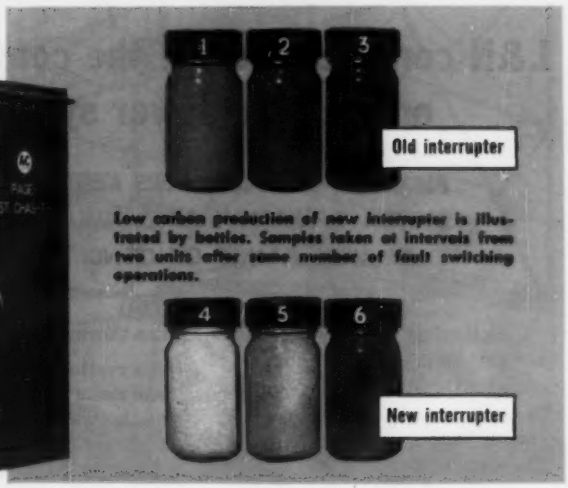
GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

ALLIS-CHALMERS... Pacing Power Progress



Graph shows short arcing times.

Ratings: 23 kv to 46 kv
500,000 kva and
1,500,000 kva



Low carbon production of new interrupter is illustrated by bottles. Samples taken at intervals from two units after same number of fault switching operations.

NEW interrupter cuts oil contamination

Reduced arcing time . . . less carbon . . . characterize new interrupting device for Allis-Chalmers frame-mounted breakers.

Contamination due to circuit interruption is greatly reduced . . . dielectric strength is extended.

Tests consisted of fault switching operations at current levels of 200 to 40,000 amperes.

Five-cycle operation

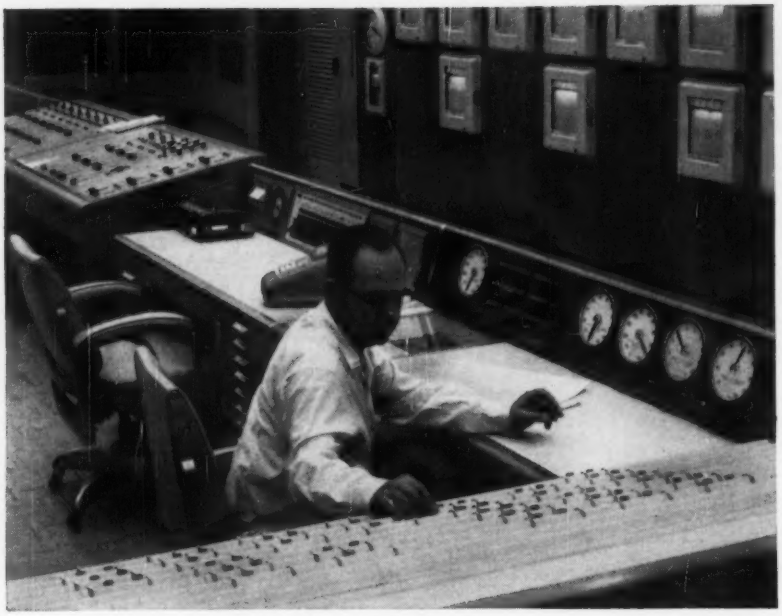
This new interrupting device with its matching high-speed *Pneu-Draulic* operator provides fast operation: closing, reclosing and interruption.

For complete details on Allis-Chalmers frame-type breakers, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

A-5916-E

ALLIS-CHALMERS



In operation since March, this L&N computer gives Florida Power & Light Co. the desired generation loading pattern on its nine major plants for strict incremental loading, or modified economy loading. The computer can also be used to study anticipated operating problems and their effects on the cost of operating the system while the load control is still in operation.

L&N computers close the control loops on 6 major power systems

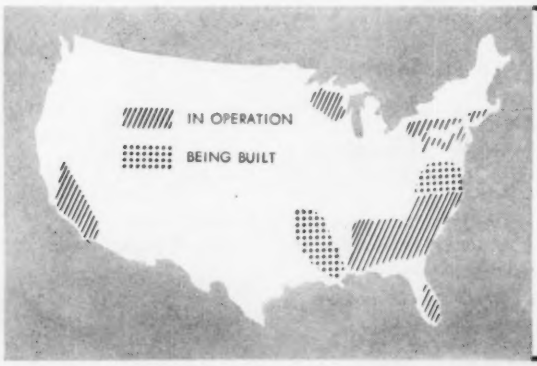
FLEXIBLE NEW COMPUTERS KEEP SYSTEM OPERATION AT OPTIMUM LEVEL OVER WIDE RANGE OF CONDITIONS

"It's gratifying to know we made the right decision." So said H. W. Page, Manager of Power Supply, Florida Power & Light Co., as he reviewed initial months of operation with his new control. He went on to say, "We know now that as a result of our decision to install this computer, we have advanced the overall level of operating efficiency on our system even more than we expected. The equipment does its job in a thoroughly dependable manner."

Suggestion: you can help *your* system make the move to advanced automatic economy dispatching more objectively—and with confidence—by checking *results* first . . . the actual operating results being obtained right now from California to Carolina, from Connecticut to Florida (names on request). Then contact our local office, or 4938 Stenton Ave., Phila. 44, Pa.

GET RESULTS ON YOUR SYSTEM WITH AN L&N COMPUTER THAT:

1. *Automatically loads generating units on an incremental cost-of-power-delivered basis—includes incremental generating costs and transmission loss factors (transmission loss matrix optional).*
2. *Provides real operating flexibility: loads on any desired incremental, or modified economy basis, to meet prevailing system conditions.*
3. *Plots "on-the-spot" graphic answers to problems involving economy interchange, power-flow losses or anticipated loading patterns.*
4. *Derives a measured lambda value —incremental cost of power delivered—at all times.*
5. *Invariably adjusts generation in a direction that reduces area requirement.*
6. *Gives each unit a terminal destination.*
7. *Makes it easy to place units on control—just flip a switch—no synchronization required.*
8. *Provides safety margins: adjustable load limit settings are positive, and cannot be exceeded; maximum rates of control action are positive, adjustable, and cannot be overridden.*
9. *Costs less in the long run: requires no unit or governor modifications, goes into service after approximately two to four weeks installation procedure, gives positive assurance against overregulation.*
10. *Is easy to operate—gives any desired readout data and, in the opinion of maintenance men, needs relatively little care.*

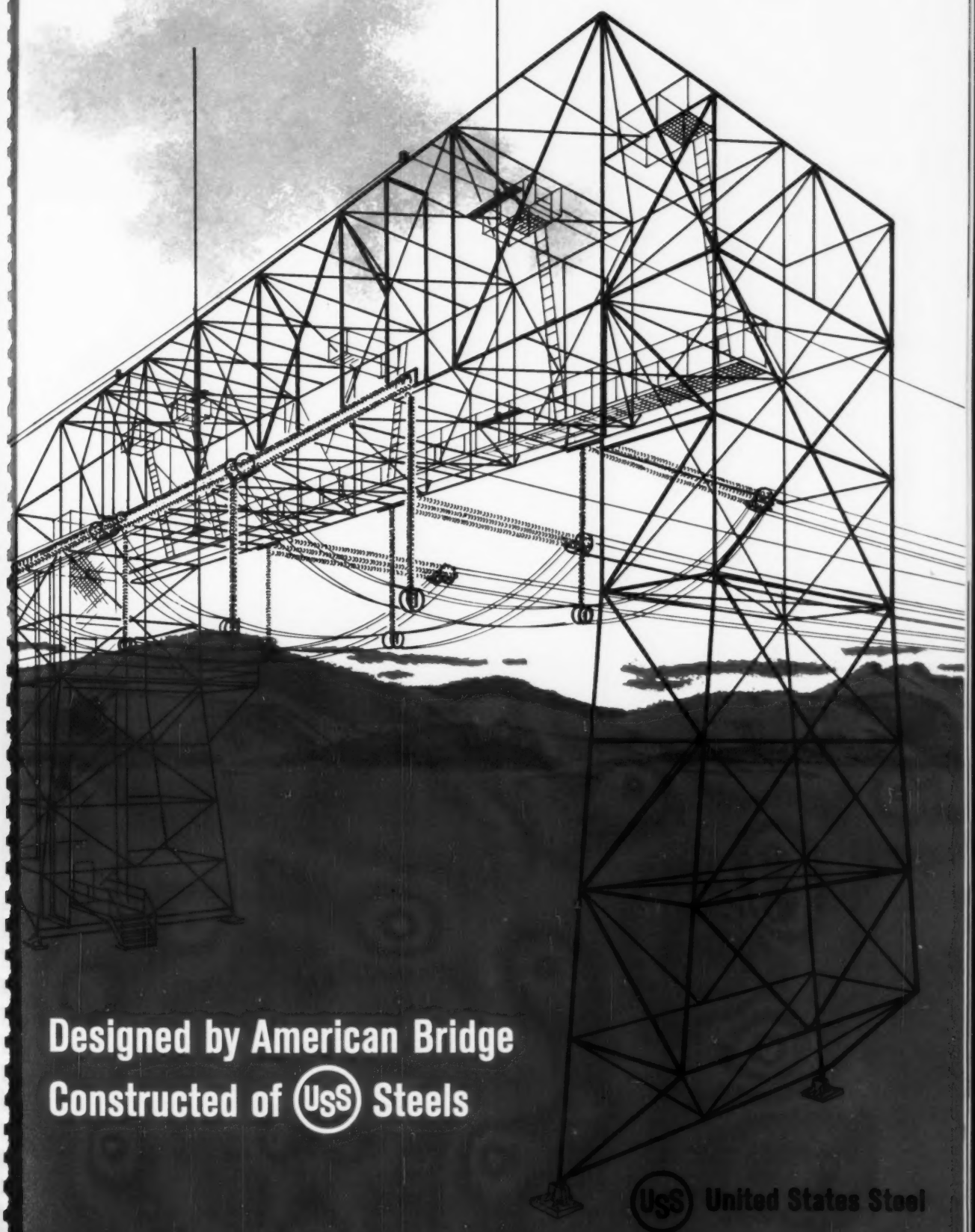


Already, L&N computers direct the control of approximately 11,000,000 Kw over a large part of the country on systems representing a wide range of operating problems. Shaded area shows territory served by an additional 5,000,000 Kw to be put under L&N computer-control during the remainder of this year.

LEEDS NORTHRUP

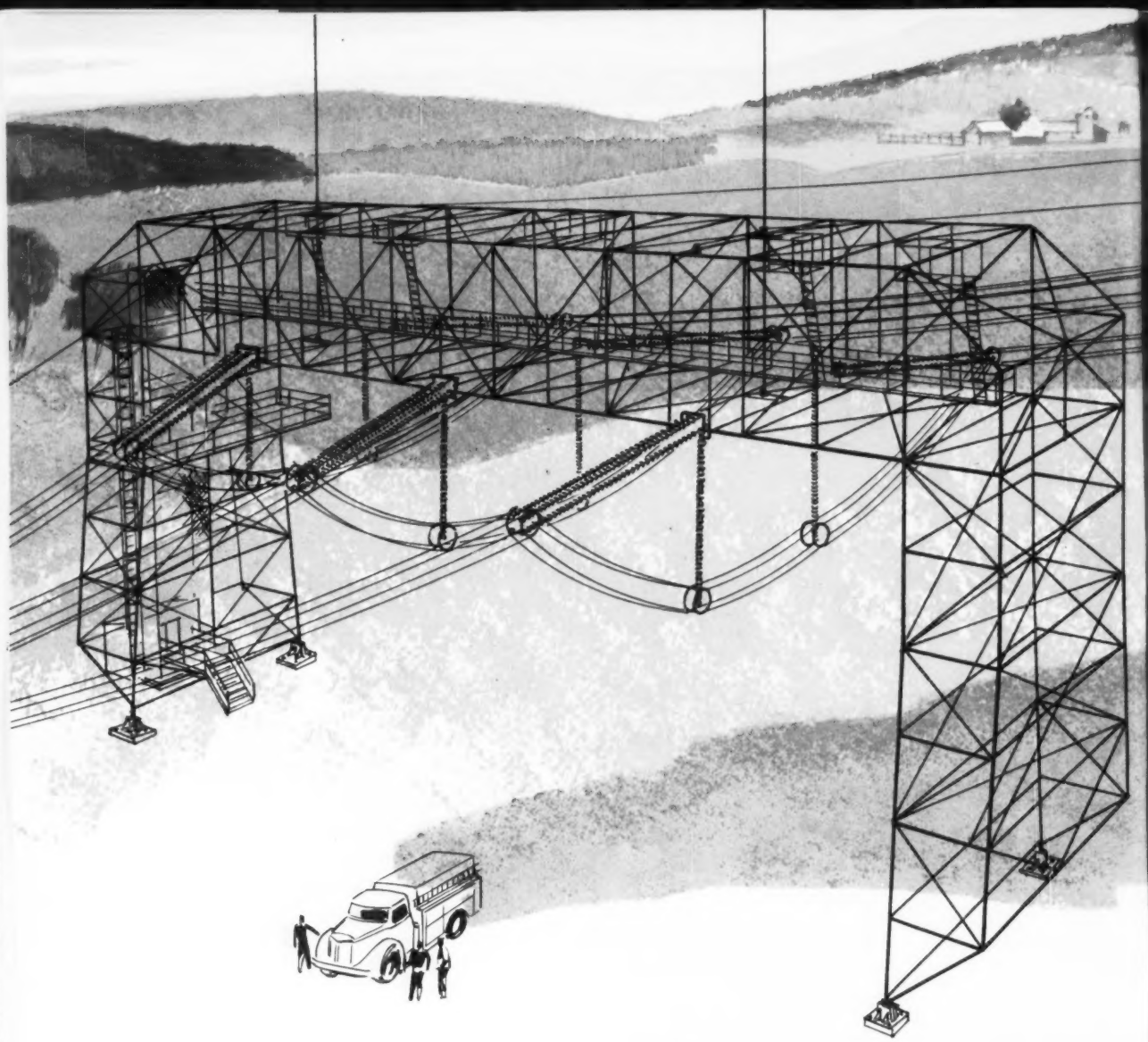
"Over 400 automatic generation control installations"

First Portal-Type Towers for PROJECT EHV



Designed by American Bridge
Constructed of USS Steels

USS United States Steel

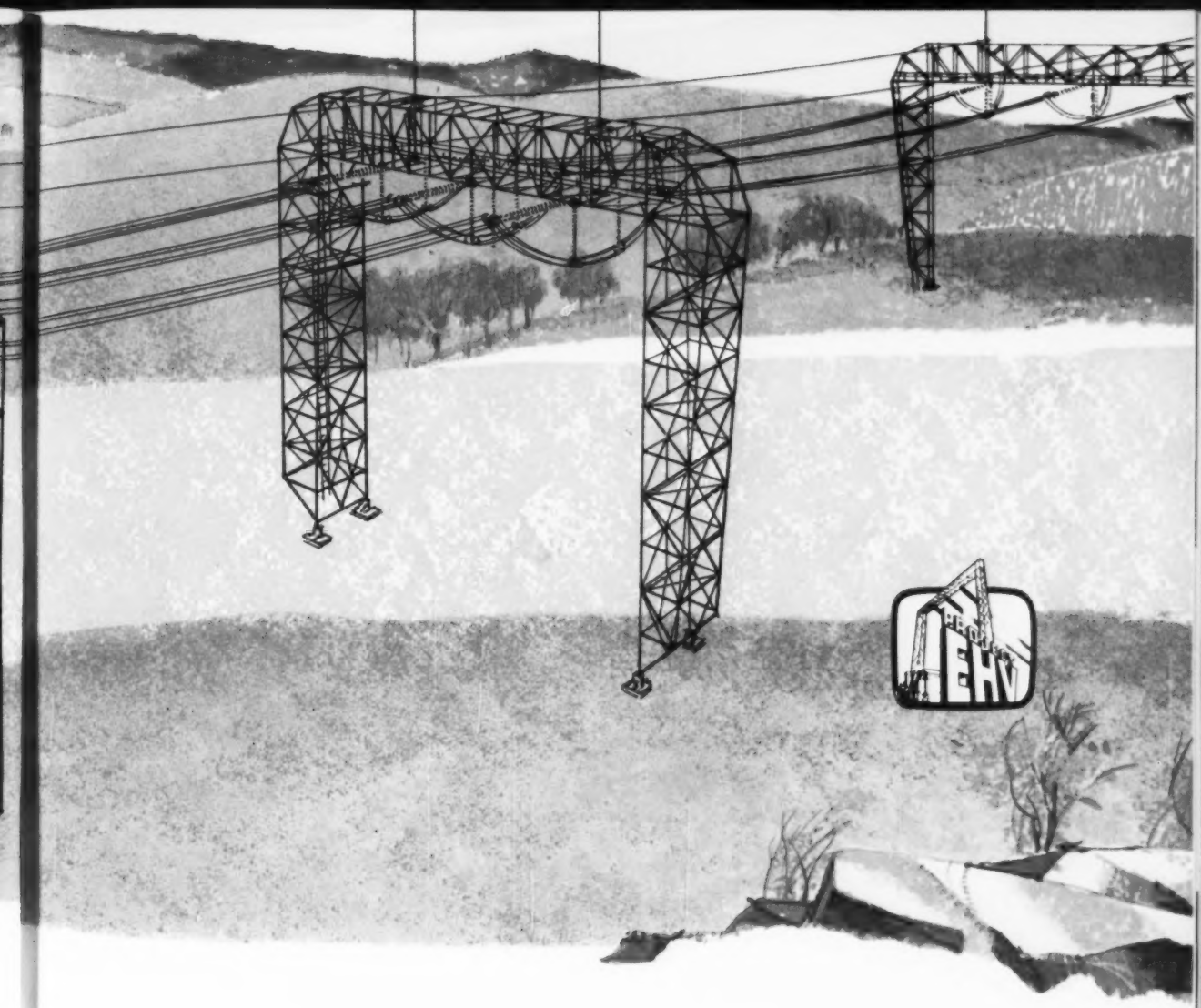


New power line to carry

Unique American Bridge portal towers provide maximum flexibility for testing

General Electric is now installing an electric transmission line that will carry a higher voltage than any other line in the world. Known as Project EHV, for extra high voltage, it will be a 4.3 mile prototype power line between Pittsfield, Massachusetts and the town of Lee. Project EHV will be a substantial aid to electric utilities in overcoming the problems and improving the reliability of future high voltage transmission. The line will eventually become a power carrying segment of the Western Massachusetts Electric Company's system at a 600 to 750 KV voltage level.

The project plans call for 18 towers. The first three of these will be large portal-type steel towers 162, 182, and 184 feet wide and 78, 129, and 116 feet high respectively. They were designed by American Bridge Division of United States Steel to permit a wide testing range of all cable configurations. Accordingly, the 4.3 mile line will be split at the third tower and energized from the north end to facilitate these tests. The remaining 3.65 mile section will be energized from the south end. This will be carried by



world's highest voltages at 460 to 750 KV

conventional towers—nine of which will also be designed and fabricated by American Bridge.

Unique pin-shoe base. An examination of the soils encountered at the sites of the three portal-type towers, indicated that it would not be possible to design foundations having any dependable degree of base fixity against moments caused by rigid frame action. It was therefore decided to design a pinned shoe at the base of the towers and thus reduce the moments caused by rigid frame action to zero at these points. This reduces considerably the overturning moment on the foundations.

High-strength steel saves weight. The stresses due to dead load, ice, vertical and transverse conductor loads and the effect of transverse wind were calculated on electronic equipment by the American Bridge Division. The tower members are structural tees with about 75% A-7 steel and 25% USS MAN-TEN Brand High-Strength Steel. USS MAN-TEN Steel was used in the higher stressed members of the top and bottom and on the inside faces of the tower legs. The use of MAN-TEN reduced tower weight by approximately 12%.

American Bridge, the world's leading transmission tower specialist, has computed tower designs for the highest voltages likely to be used in the next decade. For recommendations based on your requirements, write American Bridge, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and MAN-TEN are registered trademarks

USS American Bridge Division of United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pennsylvania
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles • Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore. • Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York

Portal tower No. 2. Color shows where USS High-Strength Steel was used in 68 chords and diagonals to increase strength and reduce weight economically.

MAN-TEN High-Strength Steel reduces weight in highly stressed tower members

The three portal-type towers used in Project EHV all make extensive use of USS MAN-TEN Brand High-Strength Steel to obtain the necessary strength with the least possible weight.

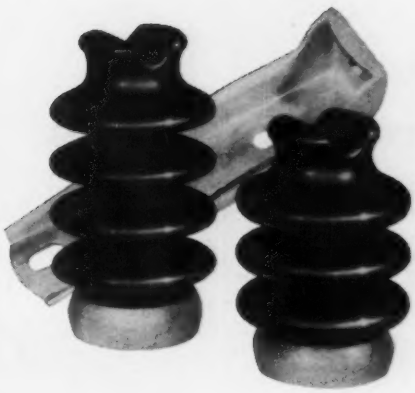
USS MAN-TEN Steel has a minimum yield point of 45,000 psi for this application, about 50% higher than A-7 carbon steel. This permitted highly stressed members to be made about the same size as adjoining carbon steel members with a substantial saving in weight. MAN-TEN Steel also has superior atmospheric corrosion resistance so it will retain its strength for the lifetime of the towers.

MAN-TEN Steel is the most economical high-strength steel but where even greater corrosion resistance is needed, USS COR-TEN is often used.

As voltages go higher, transmission towers get larger and more high-strength steel will be needed in their construction. For more information on USS High-Strength Steels, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania. *USS, MAN-TEN and COR-TEN are registered trademarks*

United States Steel Corporation—Pittsburgh
American Steel & Wire—Cleveland
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel



LAPP DISTRIBUTION POSTS

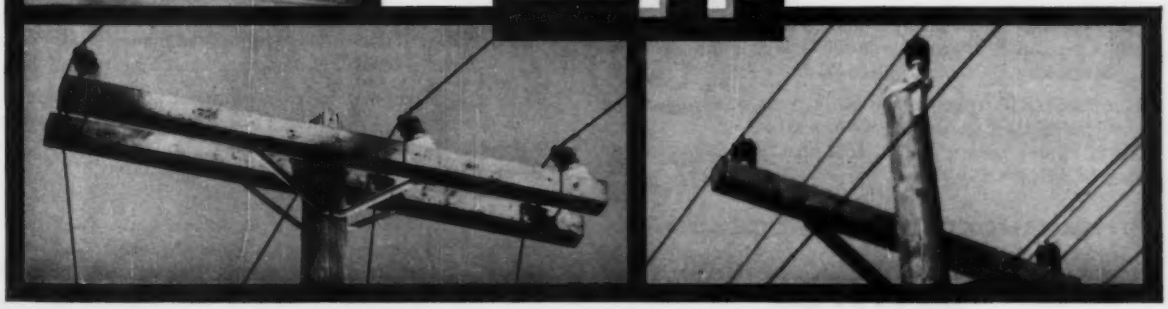
Line Post reliability for distribution lines up to 27 kv

No distribution line you can build will serve as dependably, save as much sleep for your maintenance crews, or build as much customer good-will, as the one you put on Lapp Distribution Posts. These trim-appearing "junior Line Posts" just won't puncture . . . their solid one-piece porcelain body separates conductor from ground for its full length. Won't crack either . . . the only metal-to-porcelain joint is at the base; loading of porcelain is only in large-area, low-intensity compression. Greatly more resistance to flashover and impact, too . . . has short super-sturdy petticoats, with extra protection against failure in the fact that when petticoats are broken away, the post body remains intact with almost its full insulating values. Completely free of radio- or TV-interference at any operating voltage. Fog-type for superior performance in dust or atmospheric contamination.

Where else can you get so much for so little cost? Better look into it.

Lapp Insulator Co., Inc., Le Roy, New York.

Lapp



TWO NEW LOW-COST SYSTEMS IBM 1401 CARD... IBM 1401 TAPE

with stored program speed and ability

Never before has so much powerful data processing ability been built into such low-cost systems! For in these two new IBM 1401 Systems you get features previously found only in the larger data processing systems. With 1401 Systems fewer machine units do *more* jobs . . . at *higher* speeds . . . with *greater* accuracy and reliability . . . at *lower* job cost.

To assure you of more production per data processing dollar, IBM's concept of Balanced Data Processing gives you compatible input, processing and output speeds, backed by unequalled customer service. Drawing on all the experience gained in developing the world's largest and fastest computers, these low-cost 1401 Systems bring you these large computer features:

Solid State Design—and transistorized throughout to give you a compact system with greater accuracy and reliability. This powerful system involves no special construction . . . no air conditioning.

Stored Program—gives you the fully automatic processing of electronic systems. It is the key to simplified, economical operation. Completely flexible, a stored program permits you to switch easily from one type of job to another.

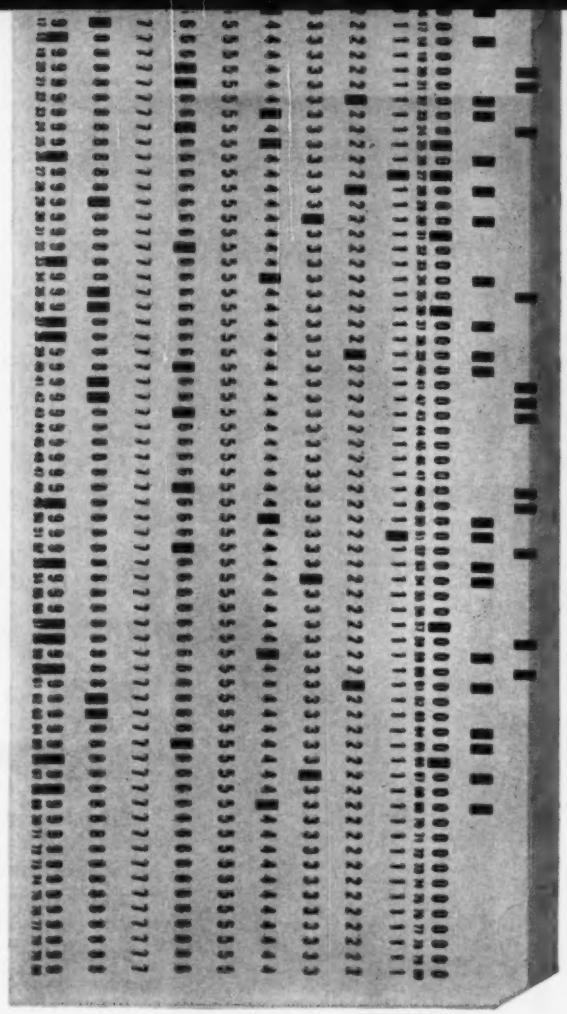
Magnetic Core Storage—the most powerful type storage available. To increase this power even further, the core memory of the 1401 accepts variable-length data and instructions, to permit the storage of only useful information. Choice of 1400, 2000, or 4000 positions of storage means you select the size storage to suit your needs.

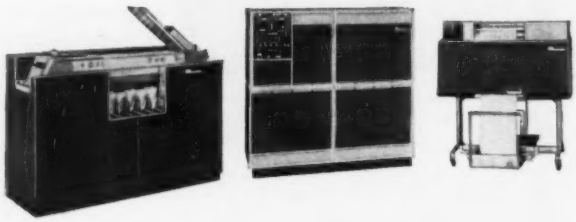
High-Speed Printing—these 1401 systems feature an exclusive new concept of printing. A horizontally rotating chain prints high-quality, perfectly aligned copy. A dual-speed carriage permits printing at the rate of 600 lines a minute, skipping blank paper at 27,000 lines per minute to produce more documents per dollar. Completely flexible editing and print format is provided by the central processor.

Your local IBM representative will explain the many applications and unusual features of the new 1401 Systems. Call him today. These systems, like all IBM data processing systems, may be purchased or leased.

BALANCED DATA PROCESSING

IBM





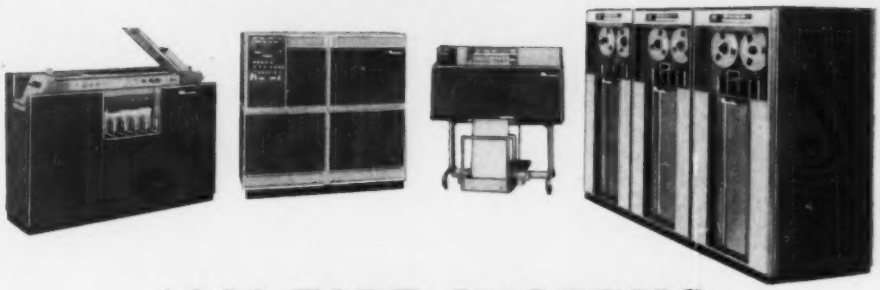
1401 CARD SYSTEMS

These stored program systems now bring the power of electronics to IBM card systems. They automatically handle the work of accounting machine, summary punch, and calculator, but at far greater speed, and with more flexibility and accuracy.

Input is faster—IBM cards are read into the system at the rate of 800 per minute. Data is processed automatically under stored-program control. Manual card handling is minimized.

Output is faster—documents are printed at the rate of 600 lines per minute, cards punched at 250 per minute. The system will turn out, for example, as many as 230 checks in one minute—again, more documents per dollar through Balanced Data Processing!

Thru-put is faster—data flow is automatically checked for accuracy and speeded all along the line. A unique Card Read-Punch combines card input, output, and summary punching functions. Five radial stackers accept cards that are selectively separated under stored program control.



1401 TAPE SYSTEMS

IBM 1401 Tape Systems give you added power through use of up to six magnetic tape units. These units feed data into the system at the rate of up to 62,500 characters per second . . . record processed results at this same peak speed.

1401 Tape Systems are also extremely valuable as off-line auxiliaries to large data processing systems. They can edit tapes prepared for larger IBM systems. They make possible a tape-oriented IBM 7070 configuration that provides higher speed input and output and makes for job cost improvement.

When tape units are added to 1401 Systems, you get greater flexibility and storage advantages, too. IBM tapes provide extremely compact storage of variable-length records—the equivalent of 129,000 IBM cards on a single reel. Tape records can be of variable length, and are read into and out of the system automatically. Also, tapes can be erased and re-used to minimize your record-keeping costs.

25+

PROTECTION PACKAGE

GUARDS DELTA-STAR OSP* TRANSFORMERS AGAINST BURNOUTS

The built-in components of Delta-Star's "protection package" virtually eliminate burnouts from *any* cause.

Besides famous "Crystal Valve" Arresters, which protect Delta-Star Overall Self-Protected Transformers from lightning and switching surges, system-co-ordinated replaceable fuse links are placed in series with the high-voltage line leads inside the transformer.

The low-voltage protective system includes a "plus" breaker sensitive to top oil temperature, an easily-seen signal light, and a handy external reset handle.

And Delta-Star OSP's are built and precision-tested to EEI-NEMA standards.

The Delta-Star PROTECTION PACKAGE means you can use the OSP's full kva capacity . . . with no fear of overload damage . . . no need to "overspecify." And buying Delta-Star OSP's saves you the time and expense of installing and co-ordinating protective systems yourself.

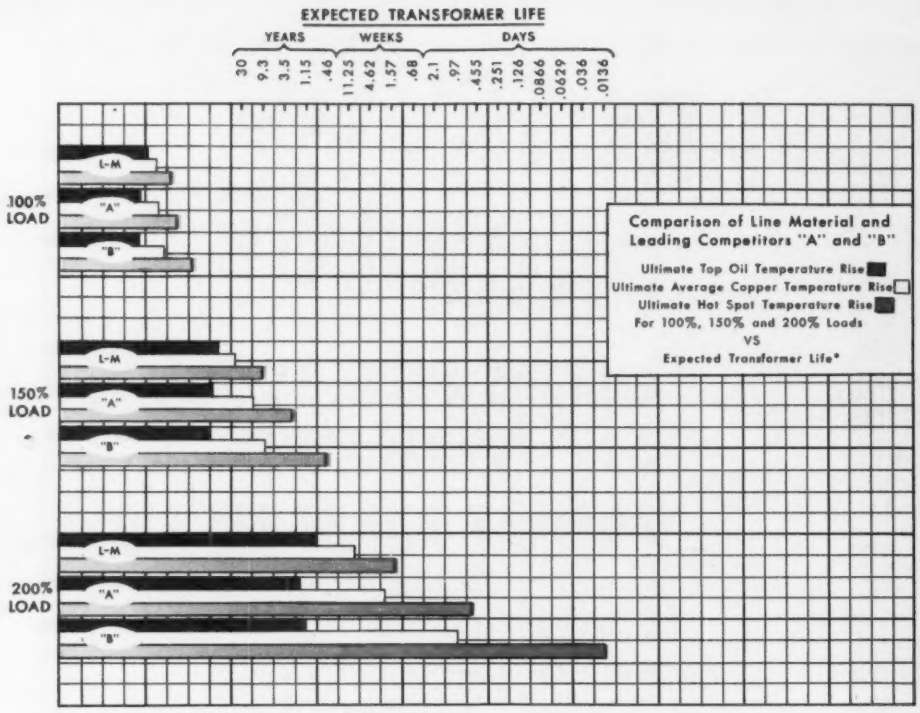
NEW CATALOG. Complete specifications on the entire range of Delta-Star Overall Self-Protected Distribution Transformers are given in our new 20-page catalog. For your copy, call your nearest Delta-Star District Office, or write *Delta-Star Electric Division, H.K. Porter Company, Inc., 17th & Cambria Sts., Philadelphia 32, Pa.*

*OSP means Overall Self-Protected

DELTA-STAR PORTER **ELECTRIC DIVISION**

H.K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION, PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.



*Basis for Expected Life Determinations available upon request

BASED ON AIEE TRANSACTION PAPER, "Life Expectancy of Oil Immersed Insulation Structures," volume 72, pages 924-29, and laboratory tests, transformer life can be estimated by comparing bar length with scale at top. (Note: the longer the bar, the shorter the life.)

L-M Increases Secondary Breaker Setting

Low winding and insulation temperatures permit uprating L-M transformers without any sacrifice of transformer life expectancy.

by **A. R. WAEHNER**
Director
Transformer Product Sales
Line Material Industries

During the past year, much has been claimed about improved transformer insulating materials and systems. This has led to confusion and justified concern on the part of many users who are interested in the long life of distribution transformers.

The anticipated life of a transformer is not governed *solely* by the insulating materials used therein—but, just as importantly, by the temperatures at which they operate. The *design* of the core and coil structure that permits the *most rapid removal* of the heat generated within the winding results in the lowest insulation temperature.

Rapid extraction of heat from the vulnerable areas of the coil reduces the internal copper temperature that causes insulation deterioration, thereby extending life expectancy.

High Top Oil Temperature

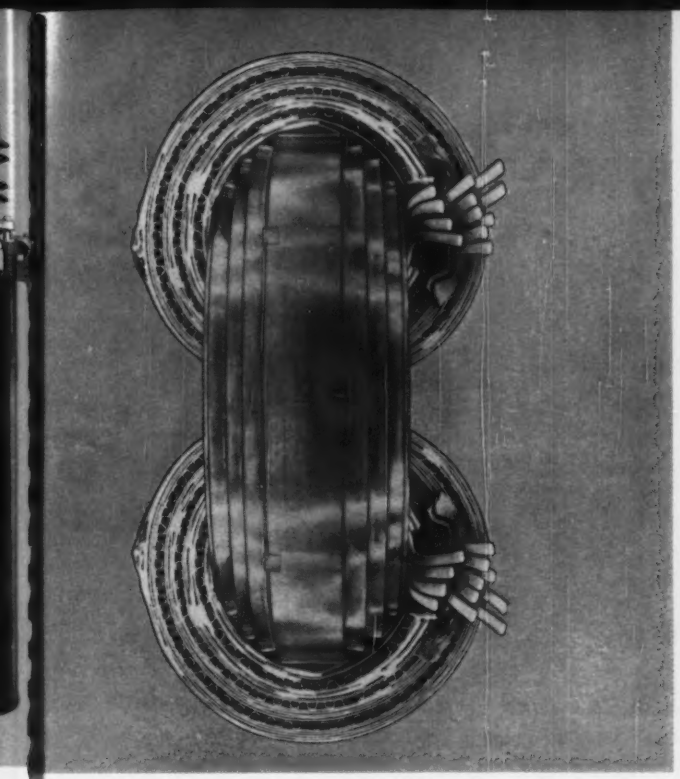
The inherent characteristics of the Line Material Round-Wound® design create *higher* top oil temperatures and lower copper temperatures than in other designs with the same total losses. This is an *advantage* and not a *disadvantage*, as it proves the rapid removal of internally generated heat. Just as hot beverages placed in a thermos jug cool slowly, in like manner other designs of cores and coils restrict the release of generated heat to a greater degree than in the Round-Wound design. Because we transfer heat to the oil more rapidly, the Round-Wound hot spot temperature is reduced, overload capacity is increased, insulation is not jeopardized, and life expectancy is extended.

Another advantage of higher top oil temperature is the more rapid dissipation of transformer heat because of the *higher* gradient between tank wall and ambient temperature of the surrounding atmosphere.

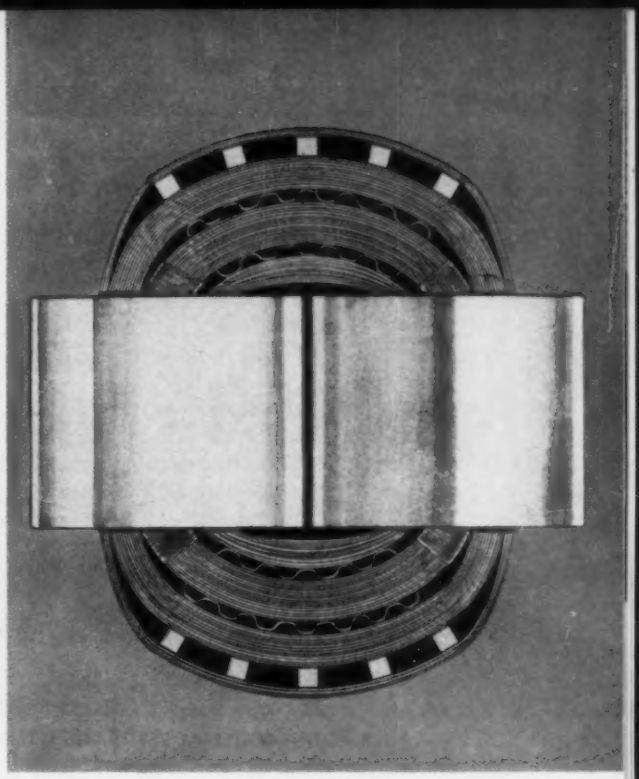
The illustrations on these pages clearly reveal a vastly greater percentage area of coil exposure to cooling oil than in competitive designs. Note, also, the many strategically located cooling ducts.

Low Temperature Gradient

Fast heat transfer in a Round-Wound core and coil rapidly raises top oil temperature *closer* to the hot spot temperature. The degrees difference is known as "temperature gradient" and is lower in the Round-Wound design than in any other make of core or shell type transformer available today. Low temperature gradient is a most significant factor contributing to long transformer life,



THIS END VIEW shows how L-M's exclusive Round-Wound design permits more oil ducts and exposes maximum cooling surface area. Winding heat is transferred more effectively than by other designs.



THIS END VIEW shows how shell type window dimensions prohibit oil ducts on the inside where heat build-ups occur. Only L-M's Round-Wound design provides concentric cooling.

on Round-Wound-Protected Transformers

especially at times of heavy overload when transformers are most vulnerable to high insulation temperatures. To take the ideal condition, if the gradient were zero degrees, heat would transfer instantly, top oil temperature would be higher, hot spot temperature would be lower, and the ultimate in life expectancy would be attained.

Laboratory tests of modern competitive samples compared with the Round-Wound design prove conclusively that at periods of heavy overload, the Round-Wound hot spot temperature is lower than with any other modern competitive design. In fact, it is *less* than the average copper temperature of at least one leading make of transformer. This is dramatically revealed in C. R. Acker's technical article in the September-October, 1959 issue of THE LINE Magazine.

Continuing Research

As a pioneer in long insulation life, Line Material, in 1951, was the first manufacturer to introduce oxidation resistant transformer oil (ORTO®). Our research and design engineers, with the assistance of Thomas A. Edison Laboratories, maintain a continuing search for improved insulation systems. If and when we find a better system, we will adopt it. The insulation system employed in the Round-Wound design, since its inception, is the finest available. The Round-Wound transformer you buy today will provide equal or greater life, under any comparable loading conditions, than any other transformer available in the industry today, *without* the necessity of a design change.

Higher Secondary Breaker Settings

Throughout the years, our Round-Wound units have enjoyed liberal overload capacity with breaker settings in line with those dictated by the current usage in the industry. Our RWP® breaker settings have been recalibrated to be as high as or higher than those offered by any other major manufacturer today. Transformers with this new breaker calibration will be identified with this symbol ‡ following the Kva designation.

The same confidence in the longevity of Round-Wound conventional transformers may be expected because the core-and-coil designs are identical.

Get Complete Information

Ask your L-M Field Engineer for the complete story on why the RWP transformer can have increased secondary breaker settings without a new design or without new insulation. Or write me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries *Transformers*

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON

THIS LINE MATERIAL SRT TRANSFORMER allows Puget Power to supply 120/240 volts, single-phase power to the remote SAGE installation high in the Cascade Mountains. The output voltage of this SRT transformer is 120 volts plus or minus 1¾ volts.

Puget Power Serves Remote SAGE Installation with L-M SRT®

An important link in our national defense is supplied regulated power by L-M Self-Regulating Transformer more economically and satisfactorily.

This Pacific Telephone and Telegraph Company-operated SAGE installation is among the many customers served by Puget Sound Power & Light Company. Located high in the Cascade Mountains of Washington, SAGE (Semi-Automatic Ground Environment) is a vital link in our national defense network. Its computer receives warnings of impending danger from advance radar networks and relays them to command headquarters. Human intelligence must determine whether an actual attack is being made and must command SAGE into action. If our nation is in danger, SAGE automatically directs the most strategic planes or missiles to intercept and destroy the attackers.

Puget Power determined that power would be delivered more economically and satisfactorily to this remote location by the use of a single-phase 2400-volt multi-grounded neutral, unshielded aerial cable.

Since one of the primary considerations was the desire to use 2400-volt unshielded cable and to eliminate the possibility of line regulation affecting this important load, SRT was considered to be ideal for this application.

This SRT has been in service through the past winter and summer, delivering 120/240 volt, single phase service. The load is sufficient to require a 25 kva SRT transformer. The Adapt-a-Tap was set for maximum boost and the voltage output maintained at 120 volts plus or minus 1¾ volts.

Get Complete Information

For complete information on the SRT transformer and how it can provide regulated voltage at any remote location, contact your L-M Field Engineer; or write Line Material Industries, Milwaukee 1, Wisconsin.

Regardless how distant your load may be from the distribution substation, the SRT provides regulated voltage.

424

LINE MATERIAL® Industries Distribution Transformers

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON

Editorial Comment

NOVEMBER 9, 1959

Fall AIEE Meeting Falls Short

The AIEE Fall General Meeting in Chicago failed in more than one way to come up to expectations, in the view of the Electrical World editors who attended. Probably their disappointment was heightened by comparison of the Chicago meeting with the really excellent Summer General Meeting held in Seattle. But our editors found more than one attendee at the Chicago meeting who shared their opinion.

Although overall conference attendance figures weren't too disappointing, the apparent "mix" of power people in the total showed the weakness of the power portion of the program. This can only indicate that the advance program is not "pulling" the desired classifications of delegates.

The attendance at some of the better sessions was embarrassingly low. For example, we found but a handful listening to some really excellent papers at the nuclear power sessions.

There was a perceptible lack of unity in the overall program. We found papers presented at some sessions which had subjects simply not mutually compatible.

Naturally, though we are most interested in power subjects, we cannot quarrel with the Institute's need for extensive presentations in aircraft, communications, fundamental research, mathematical and other non-power fields. But we can't help feeling the power aspect of electrical engineering was slighted.

We understand the Winter General Meeting at New York is expected to be a real humdinger. We are delighted, and anticipate seeing the program with interest and pleasure.

Proof of the Pudding

Editors can be churlish when schemes to entice their attention pass the bounds of common sense. To wit: Who can be serious about a press release on purplish stock with a pale orange border?

So we were wary when we uncovered the press kit from Reddy Kilowatt, Inc. Our news editor quailed when a pair of comic books tumbled out. And his attitude took a bleak turn when he read the covering letter, which stated flatly that here was "the hottest public relations program for 1960."

Not one to let first impressions predominate, our man threw the kit into his briefcase and staggered homeward at day's end. He had decided that to review comic books designed for children, he should obtain a child's opinion. In this respect he (usually thinks he) is fortunate; he has four.

The eldest pair took turns on the "Mighty Atom Stamp Book"—a 20 page magazine with four mucilage-backed sheets featuring Reddy. The approach here, as most parents know, is to tear off the stamps, lick off the flavor, and paste away. After this sticky endeavor, the seven-year-old boy read the comic book aloud to his four-year-old brother.

The next day members of New York Public School 164's 2-1 class got the first review of both books in what is known there as "Show and Tell." Later the class learned that a limited supply of books was available. How many wanted copies? Forty-two hands went up, which, in a class of 33 pupils, indicates a fair majority.

The moral: editors shouldn't prejudge comic books by their covering letters, and utilities shouldn't overlook younger customers, who, if our man's experience is reliable, are interested in Reddy's story about the industry's atom plans.

Utilities Appraise the Strike's Effect

- **The walkout's broadening impact starts slicing revenues in areas with steel mills and auto plants, but year-end figures for '59 are expected to top recession-bound 1958**

- **Bigger problem may result from shortage of steel materials and parts; new plant construction schedules have tightened**

Electric utility companies that have been sympathetic to the steel makers' battle on inflation find that, like the auto manufacturers, they no longer are on the sidelines. Their involvement, however, is just beginning in most areas.

This stands out in a recent survey, one which concentrated on the power suppliers in larger cities where the strike has cut deepest.

Beyond this is the looming threat of steel supply shortages that are tightening construction schedules in some cases and, judging from both Electrical World interviews and recent purchasing agent surveys, may portend more serious difficulties in the time it takes to get caught up on the backlog of steel orders.

Manufacturers are feeling the pinch. Boiler manufacturers state that they will be some six weeks behind schedule on early 1960 shipments. General Electric Co, Westinghouse Electric Corp and Allis-Chalmers Mfg Co say the effect is slight so far, but turbine delays will result if strike goes on much longer.

Meanwhile Detroit Edison Co reported on Oct. 19 that "delivery of many component parts have been delayed by the steel strike. As a result, construction schedules on new plant will be tight. However, no serious delay to service dates should be experienced if the strike is settled promptly."

Almost 300-million kwhr was lost by Detroit Ed from July 15 to Oct. 20. Most of this loss came in anticipated sales to steel customers. Since then, the shut-down of auto plants has deepened a load drop that to the middle of last month had been about 200 Mw.

A company spokesman pointed out that "because of the nature of the steel load —24 hour operation — only 25 to 30% of the total loss in sales (to steel customers) would have been generated on any but the more efficient equipment. In addition, the fuel cost differential between our least and most efficient units is in the range of about 0.5 mill per kwhr."

Thus the company's use of its more efficient plants saved only $50,000 for the July 15-Oct. 20 period.

During these 67 days, output was about 3,628-million kwhr. This compares with 3,429-million kwhr in 1958 and 3,618-million kwhr in 1957 for the comparable periods.

Detroit Ed estimates it has lost between $2.5 million to $2.75 million in gross revenues because of the strike.

Load Prospects in Doubt

As with other companies surveyed, Detroit Ed's residential and commercial load have helped offset the strike's effect. High auto production and abnormally hot summer weather were contributing factors but "future losses in these loads may be experienced because of delays and cutbacks in construction schedules, and the reduced availability and/or buying of major household appliances," the company said.

Shortage of structural steel is viewed as "a matter of considerable concern" at Baltimore Gas & Electric Co, said A. L. Penniman, vice president. Boiler work for a 191-Mw Crane Station unit has slowed and the in-service target date of May 1961 may not be hit, he said.

Alabama Power Co estimated a loss of $1,251,000 during the strike but expected total 1959 gross revenues to reach $115 million nonetheless vs $106 million in 1958. Construction may be delayed in the last half of 1960 because of steel shipment rescheduling by manufacturers.

Savannah Electric & Power Co, unscathed on revenues, is behind by eight weeks on a Port Wentworth station addition, but completion date is expected to be made.

Other companies in the South report no strike effects on output, revenue or construction.

Except for the struck steel mills, industrial demand has not appreciably decreased in Ohio, major power suppliers said. And high consumption by the steel makers in the first half of 1959 is keeping cumulative year-to-date losses lower than might be expected.

The state's high number of auto plants, many of which increased layoffs since this survey was taken, caused utility officials to observe that Ohio's economy is on thin edge of demand. Deterioration in demand for power will spread rapidly, they say, if steel mills remain unproductive beyond mid-November.

The effect on power company construction in the Buckeye State has been negligible.

Cleveland Electric Illuminating Co said the cumulative decrease in steel customers' demand from Jan. 1 to Oct. 30 is down 10% from comparable 1958 and 1957 periods. Demand from CEI's three steel company customers is down about 15% from what CEI considers it ought to be with normal growth.

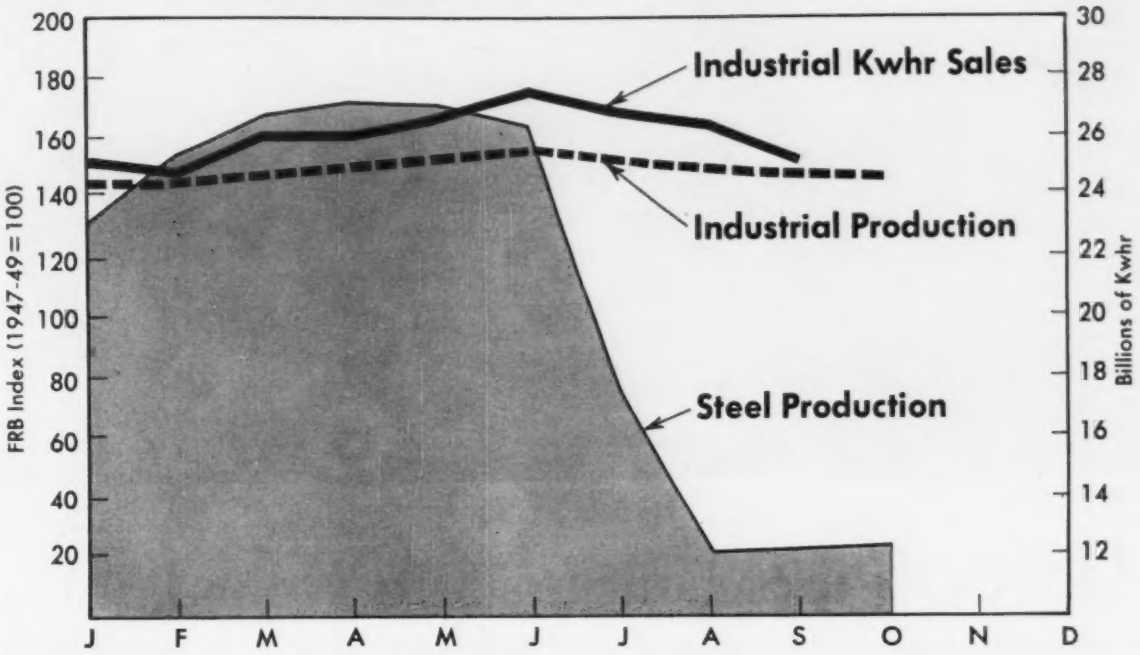
Total revenues have held up during the strike period, CEI said, and no stretchout in construction has been necessary.

In downstate Ohio one company noted a 16.5% increase in total kwhr sales during the year's third quarter over the same 1958 period. And this sales pace was holding through October.

As for construction, this combination utility had its entire 1959 gas pipe requirements paid for by July 1. "We always do this in a year when steel contracts come up," said a spokesman.

Columbus & Southern Ohio Electric Co has third quarter industrial sales up 27% over the same period last year and 8% over the 1957 third quarter.

Serving an area characterized by many small diversified manufacturing plants, Columbus & Southern was just beginning to feel a change in its demand pattern at the end of last month. Daily gross generation rate, which was 14% higher in Sep-



KEY BAROMETERS show an eight-point drop in industrial production, slide in industrial kwhr sales (EW estimate for Aug.-Sept.). Other economical indices have gone down farther in this strike than either the '52 or '56 walkout

tember 1959 than in September 1958, was only 9.1% above last year's figures through Oct. 26.

For a large power company in the Midwest, the sales losses traced to the steel strike have averaged 135-million kwhr per month. In a 79-day period since the strike began, total output was 6,547-million kwhr compared with 6,175 million in 1958 and 6,032 million in 1957.

Despite a loss of some $900,000 a month since the walkout, total revenue for 1959 is expected to hit $450 million for the company. This is $45 million above 1958 and $70 million higher than in 1957. Completion of new generating units now being built may be delayed due to delayed delivery of structural steel.

About 83-million kwhr were lost in the strike's first 45 days at Pacific Gas & Electric Co. The $1 million in lost revenue amounted to 0.28% of '58 electric revenues. An alternate transmission-routing plan is ready if a new unit is slowed by steel shortages.

Steel stockpiling by Indianapolis Power & Light Co's industrial customers helped to carry them through last month, and also helped push the power company's strike-period output to 859,439,000 kwhr. This was more than 100-million kwhr above comparable late-summer periods in the past two years. Total revenue for all of this year is predicted at $48,109,890, an increase of some $3 million over 1958 and almost $5 million over 1957.

Indianapolis P&L did some steel stockpiling also, so construction is proceeding on schedule.

Impact Light in Texas

Much the same holds true for Texas Power & Light Co and Dallas Power & Light Co.

"The steel strike hasn't adversely affected us at all and we do not anticipate that it will for the remainder of the year," said Lee Cook, Texas P&L vice president and assistant general manager.

Dallas P&L foresees total revenues of $49.3 million this year compared with $45.8 million and $41.5 million in 1958 and 1957.

In Pueblo, where Colorado Fuel & Iron Corp generates its own power, the Southern Colorado Power Co reported a loss of some 2-million kwhr in sales to industries allied to steel. This represents a $25,000 loss of revenue. Total 1959 gross, however, is expected to hit $7.9 million. This is 6.85% over 1958.

With the early Kaiser Steel Corp settlement, Southern California Edison Co recouped the 5.5% drop in its weekly load output. The auto production slowdown caused no sudden drop in sales early in October.

The Los Angeles Dept of Water & Power, "nipped" by the difficulty in obtaining certain sizes of pipe, reported that power demands were holding steady.

Montana Power Co has another strike to worry about. On Aug. 19, workers left their jobs at the Anaconda Co, which provides about $8 million in MPC's annual revenues, $5.5 million of which comes from power sales. Increasing residential and commercial demands, sales of 145-Mw of surplus power to neighboring systems, and a 1958 rate increase helped MPC increase earnings by 11¢ per common share in 12 months ending Sept. 30 over the $1.32 figure for the same period ending in 1958.

"Even if the copper strike lasts through the end of 1959, we think we'll do a little better than in 1958," said MPC Vice President C. W. Raff.

None of the contacted companies reported any furloughing of their employees.

LAND CONFIGURATION provides recirculatory path that prevents warm water discharge from going into cooling intake

SEGCO Picks Unique Site Near Fuel

"SEGCO (The Southern Electric Generating Co) chose the site of its No. 1 steam plant near Wilsonville, Ala., for three good reasons," said James F. Crist, president, during a recent visit of Alabama Public Service Commission members to the construction sites of the generating plant and associated coal mines.

Crist cited the reasons as:

- Continuing need for large blocks of additional generating capacity within economical transmission distance of the projected load centers of Georgia Power Co and Alabama Power Co systems, which together furnish nearly 90% of the Southern Co's total revenue.
- Substantial economic benefits in the use of low-cost fuel from the vast Alabama coal reserves and in the use of large high-temperature, high-pressure generating units.
- Unique land configuration of the site caused by the junction of Yellow Leaf Creek and the Coosa River. This provides an unusually long recirculatory path which tends to prevent the warm cooling water discharge from being drawn into the cooling water intake.

The Georgia and Alabama companies own all of SEGCO's common stock on an equal share basis. Each will use one half of the capacity of the plant. Initial capacity of the plant will be 1,000 Mw and cooling water tunnel capacity is being provided for an additional 600 Mw.

Coal Reserves Total 340 Million Tons

Other SEGCO properties will include two coal mines now under construction; coal reserves of approximately 340 million tons; and three 230-kv transmission lines, two of which are presently under construction, to deliver power to the Georgia system.

Initially the plant will consist of four 250-Mw turbine-generating units. The first is scheduled for operation in April 1960, the second in July 1960, the third in April 1961, and the fourth in April 1962. Two additional 300-Mw units would bring ultimate capacity to 1,600 Mw.

The Southern Co power pool will control plant loading from Birmingham, using its "Early Bird" automatic load control computer.

SEGCO will construct and operate three 230-kv transmission lines. Two lines will deliver power to the Georgia system at the state border near Columbus, while the third will connect at the border southwest of Atlanta. Georgia Power will build its own 230-kv lines from the state line to deliver power to Atlanta, Columbus and Tifton load centers. Alabama Power will take delivery of its share of the production at the plant, but will transmit it at 230 kv to load centers at Montgomery to the south, Leeds to the north, and Anniston to the northeast.

Biggest Mine 120 Miles from Plant

The SEGCO No. 1 coal mine is in the Warrior field near Parrish, Ala., about 120 miles by rail from Wilsonville. The mine will be developed and operated by Alabama By-Products Corp acting as agent for SEGCO. The No. 1 mine is designed for a production capacity of 1.5-million tons annually of 12,500 Btu/lb coal. It will be in full production in May 1961.

The SEGCO No. 2 coal mine is in the Cahaba field near Maylene, Ala., 39 miles by rail from the generating plants. This mine will be built and operated by SEGCO personnel and is designed for a production capacity of 500,000 tons annually of 14,000 Btu/lb coal. This mine will be in full operation by January 1961. Studies looking to expansion of its production to 1-million tons annually are now under way.

The Southern Railway will haul the coal, making a round trip per day between the mines and the generating plant. Each mine's daily production will be delivered to the generating plant coal storage yard, and empty cars of the previous day's delivery will be handled on the return trip. Rotary car dumpers will be used at the plant. A fleet of 245 aluminum, roller-bearing gondola cars for this special service is being built by Pullman Standard Car Mfg Co.

Britain's Gains, Problems Reviewed

Electricity Council foresees bulk rate stability in next three years, right-of-way difficulties, balanced fuel supply

J. H. M. SYKES, Special Correspondent, Bedford, England

A statistical review and an appraisal of future progress and problems of the nationalized power industry of England and Wales have been presented in annual reports to Parliament, through the Minister of Power. The reports originated with the newly constituted Electricity Council, and the Central Electricity Generating Board.

The industry as a whole was largely unaffected by the 1958 recession in Britain, according to the joint reports. Although industrial demand rose only 3.7% (compared with 7.9% in 1957), the rise in total sales reached 7.9%.

Sales Price Rises

For the Area Electricity Boards, which distribute power in 12 England and Wales divisions, sales totaled 78,098-million kwhr. Average price was 1.554 pence compared with 1.533 pence in 1957. (One pence is equivalent to 1.17¢ U.S.)

C. R. King, council chairman, said it was hoped that the generating board's bulk rates to the area boards could be held stable for at least the next three years.

As of March 31, 1959, the generating board owned 238 power plants with installed capacity of 25,409 Mw, and a send-out capacity of 23,400 Mw—an increase of 4.7%. Maximum demand was 20,899 Mw (up 8.2%) and overall thermal efficiency rose from 25.51% in 1957 to 26.10%.

Construction plans for 1959-60 call for addition of 12,300 Mw in 25 new plants, eight plants now partially in operation, and five new sections in existing plants. Five nuclear plants are included in this program. To link these generators to load centers, a further 1,000 miles of 275-kv double-circuit transmission grid lines are under construction or planned. By 1963, the 275-kv grid will have over 1,900 miles of double-circuit lines.

One of the main headaches of the industry is found in the storm of protests that follow announcement of plans to build plants and overhead lines. It is almost impossible to get consents for more overhead lines in certain areas. Two years are now needed to argue with landowners and, finally, to take the matter to the courts for compulsory orders. The Britain-France channel cable scheme has been postponed one year owing to almost insuperable right-of-way difficulties.

According to Sir Christopher Hinton, head of the generating board, the whole future of supplying England's East Kent area will be in jeopardy in two years if some way to get around the right-of-way problem is not found. Cost of installing a supergrid feeder underground would be 17 to 18 times as much as an overhead line, and would add 10 to 15% to bulk rates there.

Britain, once a single-fuel nation, has now changed to a three-fuel nation, in regard to power supplies. Little hydro is available, and the future lies with coal, oil or nuclear energy.

The National Coal Board has estimated that demand for coal will in six years be no greater than in 1959—200-million tons. Coal still will supply almost 80% of the nation's needs in 1965 but the estimate for then is 40-million tons below predictions in 1956.

Still another problem is foreseen in the recruitment of engineers. University graduates generally do not favor the power supply industry, but prefer the freer atmosphere in manufacturing. One possible improvement is a scholarship program which will take a boy right from primary school through high school and university.

Load Factor Falls to 46.5%

Load factor fell from 47% in 1957 to 46.5% last year, the reports noted. Some areas are providing off-peak rates with small reductions to improve the situation, but the reports contained little to suggest that any significant improvement can be hoped for. There is no sign that British industry will look with favor on the main change—working more than one shift—which would improve load factor.

Two Georgia Towns Seek TVA Power

A plan to obtain power from Tennessee Valley Authority has been agreed upon by officials of Ringgold and Chickamauga, Ga. The towns have 600 and 1,000 electric customers, respectively, now served by Georgia Power Co.

The plan is to build a distribution system for about $½ million. This would be operated by one power board serving both towns, which are 15 miles apart just below the Tennessee state line.

The proposal also has been agreed upon by TVA officials who met with the towns' mayors Oct. 28. A statement by the mayors said, "Preliminary engineering studies now are under way and it is expected that a joint request of the two municipalities will be made to TVA for a standard power contract in the very near future."

Ringgold Mayor Marvin F. Partin estimated customers in his town could save about $35,000 a year by using TVA power. He said a new system would cost $150 to $200 per customer.

Earlier, the town offered Georgia Power $200 per customer for the company's local facilities, he said, but this was rejected.

J. E. Watson, TVA director of power utilization; Paul Button, chief of the wholesale marketing branch; and G. A. Reidinger, attorney, represented TVA.

Gas Industry to Expand Research

Convention-goers hear AGA will increase promotion, advertising and research budget 39%; tough selling job lies ahead

The American Gas Assn will put intensive, expanded effort into research in the future. This was brought to light by J. Theodore Wolfe, president, AGA, and president, Baltimore Gas & Electric Co, at AGA's 41st annual convention in Chicago last month.

A 39% increase in the PAR (promotion, advertising, research) budget for 1960—from $1.8 to 2.5 million—has been approved. Wolfe predicted, however, that it will be raised to $6 million by 1965.

He noted, moreover, that if gas appliance manufacturers raise their research expenditures, and gas utilities continue their activities, the total research effort of the gas industry will treble by 1965—to close to $15 million.

"The past year has been a year of challenge," Wolfe went on. "Stung by the effectiveness of the gas industry's sales and promotional attack, competitive industries have mounted what they doubtless hope will be effective counterattacks."

He listed the competition as:

- Edison Electric Institute and its "Electrical Living Program"
- The oil industry's $3-million program to promote oil heat
- National Coal Policy Conference's plans to recapture the markets lost to oil and gas.

"But competition is the spice of life," he told the 2,600 delegates at the confab, and there is no cause for alarm. Rather the attacks are a tribute, he said.

Year of Decision

Last year was a year of decision, he pointed out. The Gold Star Program, for example, concentrated sales and promotional efforts on top-quality gas appliances; and expanded cooperative research evolved. Also, the AGA has now registered under the Lobbying Act so that it could "speak for the industry and keep (it) intelligently informed on legislative matters."

The past year has also been a year of self-appraisal, Wolfe commented. A recent survey showed that there is "an appalling amount of ignorance and even misinformation on the part of the public towards the industry," Wolfe noted.

In 1970, the gas industry will be serving 45 million customers, sales will have doubled their present volume, and gross plant investment will be 2½ times today, Wolfe predicted.

"If the gas industry wants to remain in competition for customers' dollars, it will have to engage in research . . . to an extent that few of your company executives seem to have been willing to contemplate," T. Keith Glennan, administrator, National Aeronautics & Space Administration, warned. Soon electric and gas industries will be joined by nuclear power in the battle, he commented.

How to compete? Glennan suggested: Improve service to the customer; raise efficiency to offset increasing operating costs; invent new sales promotion techniques which will appeal to customer emotions; understand energy generation and conversion processes; and make significant advances in technologies involved in gas company operations.

In the ranking of important industries supporting research, the gas industry is at the bottom of the list, Glennan noted. "It is therefore safe to predict that over a period of years the gas industry will become a backward, nonprogressive industry, if it does not greatly increase its research activities . . ."

Perrine Stirs Group

In a speech that had convention goers talking about it well into the lunch hour, George R. Perrine, chairman, Illinois Commerce Commission, said, "The success or failure of the gas industry depends upon several important cogs: The production, transmission, distribution financing, legislation, and regulation of the industry. The failure or breakdown of any of them could cause a decided retrogression in your industry.

"Without good regulation, all too often the public awakens to find the handy, generally accepted utility commodity or the service gone and the company reduced to a point bordering bankruptcy."

Perrine called for closer contact between utility and commission,

FEATURES OF AGA promotion, advertising and research program are pointed out to an interested attendee by T. L. Robey, AGA's director of research

better public information, and the adoption of automatic fuel clauses.

He closed with critique of electric cooperatives. "... It appears somewhat ridiculous for the government, which is now having to pay 4 to 5% for its money, to loan money to the electric co-ops at 2%. If privately owned utilities are forced to pay 5 to 6% for their money and also to bear the tax burden which co-ops escape, the rates which such privately owned utilities . . . will have to charge for this service may well bring the public clamor for government or public ownership.

"The goose that had been laying considerable tax eggs may well be killed by the fox that has been eating up a considerable number of the same tax eggs," he concluded.

Electric Heat to Compete

While his speech touched mainly on discovery, production, transmission and distribution of natural gas, Robert W. Otto, chairman, Laclede Gas Co, had some pungent things to say about the competition for the heating business.

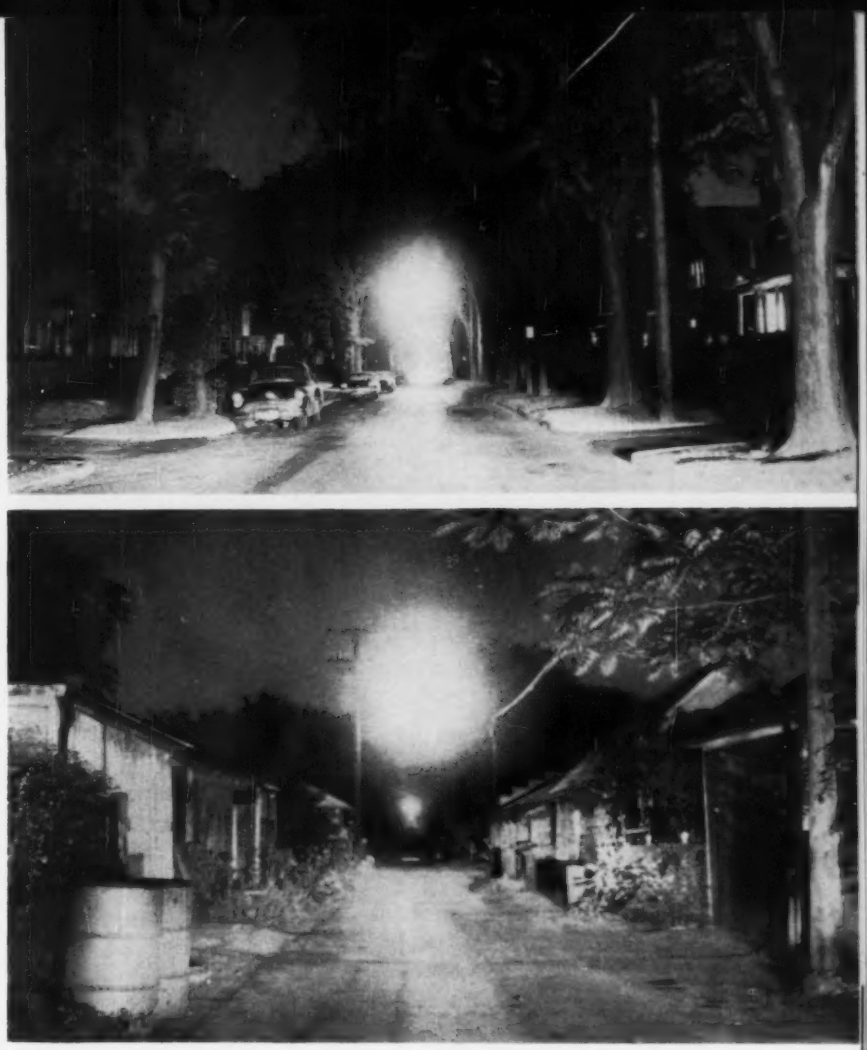
"Our competition is going to get tougher," he said. "Heating with electricity as of now is very much more costly than heating with gas, but we can't count on it staying that way. Electric heating equipment is bound to become more efficient, and the price of gas is inevitably going to go up.

"As the great price advantage we have enjoyed for so long is narrowed, we shall have a tougher and tougher selling job to do against the competition of electricity, oil and coal."

Otto saw some bright spots, in the selling phase particularly, however. "We have sold 32 million customers so far. AGA predicts that by 1970, we shall have sold 12 million more," he said.

The entry of Arkla-Servel into the air conditioning business; RCA-Whirlpool's decision to "put its great resources to work for gas"; and Norge's development of a new refrigerator, are developments that warmed Otto's heart. But research, development and production of "constantly improving" gas using appliances are a necessity to selling more gas and improving load factors, he pointed out.

W. H. Ligon, president, Nashville Gas Co, was elected head of AGA.



STREET AND ALLEY relighting in Highland Park, a Detroit suburb, has cut crime. The city was first in U. S. to meet IES standards adopted in 1953

It's No Crime to Sell Lighting

"Yes, we do mention crime when we're trying to sell improved street lighting. But it's strictly a minor point."

This, in effect, is what a McGraw-Hill news bureau man heard when he inquired about a large power company's efforts to promote modern street lighting on the basis of its deterring crime.

Judging from interviews by other news bureaus and Electrical World's field editors, this approach is typical.

The inertia is attributable, in part, to the make-up of U. S. load centers. As G. G. Wheeler of Northern States Power Co puts it:

"The majority of electric utilities serve smaller cities of around 5,000 population where crime just isn't that important. There the stress is on traffic and pedestrian safety, convenience, pride in the community, and improving business."

The lighting-crime emphasis is important, Wheeler adds, in the East and in bigger cities.

In these areas the inaction stems, perhaps, from a lack of local statistical data proving the relationship. Some utilities apparently feel that pinpointing crime smacks of "scare" promotion.

Whatever the cause, there are some figures available that suggest utilities are underplaying this street lighting facet, a facet which could brighten not only the off-peak load

ROAD SHOW is Northern States Power tool that could help sell relighting for crime-prone areas

charts but the public's regard for the power suppliers as well.

The first figure concerns the sad status of residential street lighting in the U. S. Only 2% of these streets are illuminated well enough to protect homeowners against crime and accidents, based on the Illuminating Engineering Society's standards adopted six years ago.

The second statistic comes from the Street & Highway Lighting Bureau in Cleveland. Its poll of U. S. police chiefs revealed that major crimes of violence decreased an average of 50% along streets where modern lighting was installed.

Lighting Has Its Obstacles

While city officials quickly agree that better street lighting means less outdoor crime, the route from agreement to higher ft-candle levels is usually fraught with obstacles.

An example is New York City. The Department of Water Supply, Gas & Electricity presented a six-year relighting program recently to the City Planning Commission. The badly needed modernization would cost about $80 million.

Favorably impressed by results of a recent before-and-after crime study in relighted areas (EW, Nov. 2, p 50), the City Planning Commission whittled the program to $26.5 million, however, and submitted it to the Board of Estimate.

The board is now studying the proposal before passing it on to the City Council about the end of the year. Council approval would then give the department access to funds from future capital budgets.

With New York enmeshed in a host of other urban problems, all of which require taxpayers' dollars to provide solutions, it seems likely that the street lighting modernization plan will suffer further slashes if and when it is adopted.

Inflation Hits Lighting, Too

The difficulty of satisfying more civic needs with inflationized taxpayers' dollars is a common one. This is the main reason, some observers say, that the lighting-crime story deserves emphasis if street lighting improvements are not to be regarded as "something we'll get to when there's a surplus."

Cleveland provides a case in point. Both Cleveland Electric Illuminating Co and the city's Department of Light & Power underscore the crime aspect in their lighting efforts. The sales department of CEI, which services 18,000 of the 40,000 lights there, utilizes ft-candle studies made in high-crime areas to sell new lighting programs.

The municipal system, headed by Commissioner Vincent M. De Melto, in 1956 completed a six-year relighting that required an average of $25 million a year. New installations on major highways and freeways now under construction will find lighting expenditures at the same yearly average from 1959-61.

As for results, John N. McCormick, city safety director, points to a 4.5% decrease in the 1958 crime rate while national figures climbed 9%. The figures for 1959 will show more than an 11.5% decrease below last year, he believes. As McCormick observes: "The odds are against the criminal in a well-lighted area. Chances for detection and identification are much greater."

Pacific Gas & Electric Co doesn't hesitate to emphasize the crime-inhibiting features of good lighting in its help to cities on master street lighting plans. Over 80 communities have adopted the step-by-step improvement guide.

"We can't give you any specifics on crime reduction," a PG&E spokesman says. Police chiefs in relighted cities, however, have noted more effective law enforcement and easier traffic control.

A successful crime-cutting program in suburbia has been hailed in Highland Park, an adjunct to Detroit. The community was the first in the U. S. to relight to the IES "American Standard Practice for Street & Highway Lighting."

At the end of World War II Highland Park had 1,277 street lights compared with 2,295 in use now. Monthly cost for the lighting system is $12,500 compared with $6,500 in 1945.

With center-of-the-street suspension of lamps and alley illumination, the relighting has eliminated the city's dark tunnels. "We have had not more than one alley holdup since," says Police Chief Dewey Schultz.

Highland Park's neighboring suburban cities have followed suit. For the U. S. as a whole, however, the relighting to IES standards has been dimmed in residential areas by too little regard from officials and not enough civic support.

IES Revisions Planned

Nonetheless, IES committee members are proceeding with revisions in the existing standards and are expected to have them ready for publication late next year. While only 2% of residential streets may now be illuminated to IES recommendations, the percentage of adequately lighted arteries and highways is probably near 50%.

One promotion device that is helping brighten streets in Northern States Power Co's divisions is a demonstration truck. The recently purchased truck has a 25-ft sectional pole that shows how different luminaires will look and how well they'll illuminate the street.

NSP's G. G. Wheeler, manager of municipal sales, says early use of the "show on the road" has been a considerable success.

Wheeler is heading up a subcommittee for the Edison Electric Institute Street & Highway Lighting Committee. The new group is working on details for a program that may include suggested methods for carrying on successful street light promotion, together with promotional material and data providing a well-rounded sales program.

But it's unlikely that the subcommittee will place any special emphasis on the lighting-crime relationship, Wheeler told EW.

AIEE Explores Reactor Technology

Chicago meeting hears studies of designs, net cost of power for various types; economic power still remote

CHAIRMAN F. A. COX briefs AIEE President J. H. Foote (Commonwealth Associates) and Commonwealth Edison Vice President Murray Joslin on program. General Meeting Chairman E. H. Finch (Sargent & Lundy) checks coordination

Today's reactor technology involved in the design of large-scale boiling-water, heavy-water, and organic-moderated power plants was thoroughly analyzed and evaluated in an all-day session on nuclear power that was distinguished by the high caliber of its papers and unusually poor attendance. A small audience heard representatives of consulting and manufacturing firms describe studies of the design and performance of a variety of nuclear power plants, initiated by the Atomic Energy Commission.

Studies by Bechtel Corp and Atomics International of the design for a 300-Mw organic-reactor power plant showed that the greatest potential was in a reactor moderated by the same organic fluid used as the coolant. The net cost of power at 80% plant factor was calculated to be 8.12 mills per kwhr. This compares with 6.77 mills per kwhr for a 305-Mw plant burning fossil fuel costing 35¢ per million Btu, C. H. Bosworth and W. E. Parkins reported. They said that power cost for a 300-Mw OMCR has not reached a value achievable with conventional installations, although the margin is dwindling. A 11.4-Mw OMCR plant is under contract for Piqua, Ohio.

Sargent & Lundy's study of heavy-water (D_2O) reactors for the AEC indicated that the boiling D_2O-cooled, pressure-tube, direct-cycle concept offers the best promise of development among heavy-water types. Preliminary design of a 65-Mw prototype plant indicated an investment of $720 per kw and an energy cost of 19.1 mills per kwhr. Fuel is expected to cost 3.2 mills per kwhr based on a burnup of 6,100 Mw-days per ton. Research and development costs were estimated as $10.7 million. The study was reported by F. W. McCloska and C. A. Hatstat.

Large BWR Plant Evaluated

The conceptual design and performance of a boiling-water reactor plant of 306 Mw developed for AEC by Ebasco and General Electric Co carried a research and development cost of $2.9 million. Energy cost was 8.6 mills per net kwhr, and capital costs $284 per net kw. F. C. Reichle, Ebasco, and W. A. Hartman, GE, said the dual-cycle, forced-circulation boiling reactor was preferred to either external natural-circulation or single-cycle forced-circulation reactors because it follows load changes better and has had considerable engineering done on it.

A nuclear boiling superheat reactor study by General Nuclear Engineering Corp on a 50 tMw experimental boiling superheat reactor, delivering steam at 850 psi, 900F, was described by J. West. The difficulty of using control rods in the boiling region without upsetting the balance between boiling and superheat regions led to use of unique slab-type control rods in the superheat region around the periphery of the reactor core and cruciform rods in the boiling region near the core's center. The study established the short-time feasibility of the design, but the long-time performance of superheat elements remains in question.

In summarizing AEC's evaluation of four similar studies of large-scale, pressurized-water, boiling-water, organic-moderated and heavy-water type reactor plants, D. B. Coburn, Atomic Energy Commission, made these points:

- Research and development costs for the four reactor types vary widely. They were estimated to be $2.9 million for the BWR, $8.4 and $8.6 million for the OMCR and PWR types, respectively, and $10.7 million for the heavy-water type.
- None of the studies showed nuclear power to be economic today, but indicated that it was closer than had been originally assumed.
- The PWR had been considered obsolete but studies show that it could probably be built at the lowest cost, using fossil-fired superheat.
- The organic-moderated reactor has features that make a plant in the 300-Mw range doubtful today.
- Heavy-water reactors can't compete with other types on a cost energy basis. Per-kwhr costs are 2 to 3 mills higher.

• The BWR offers good potential on the basis of work on Dresden and SENN designs. It was characterized as the one most likely to be built.

Coburn said the commission did not find the difference in energy cost significant among the three enriched-uranium systems. At present, it is impossible to say which is most likely to produce economic power, he said. Consequently AEC is not planning on building these large reactor power plants.

AEC Compares Energy Costs

Results of an AEC effort to consolidate present energy cost data for various reactor types on a comparable basis for evaluation were reported by H. E. Vann, AEC. Unified on a common basis for a 300-Mw plant and assuming 14% fixed charges, 80% load factor, 4% uranium use charge, energy costs in mills per kwhr were:

Pressurized-water	9.56
Boiling-water	9.61
Organic-moderated	11.35
Sodium-graphite	11.60
Breeder	12.25
Heavy-water moderated	12.50
Gas-cooled (British)	11.89

Whether economical thermonuclear power can be derived from controlled hydrogen fusion may be determined by 1961, according to a report by N. W. Mather, R. G. Mills and J. G. Murray of Project Matterhorn at Princeton, N. J., where a new stellarator is being built. The device uses externally produced magnetic fields to confine a plasma of hydrogenic ions and electrons while it is heated and maintained at a temperature high enough to produce fusion reactions, it was explained. With the stellarator it is hoped the conditions for controlled thermonuclear reactions can be discovered and the process demonstrated.

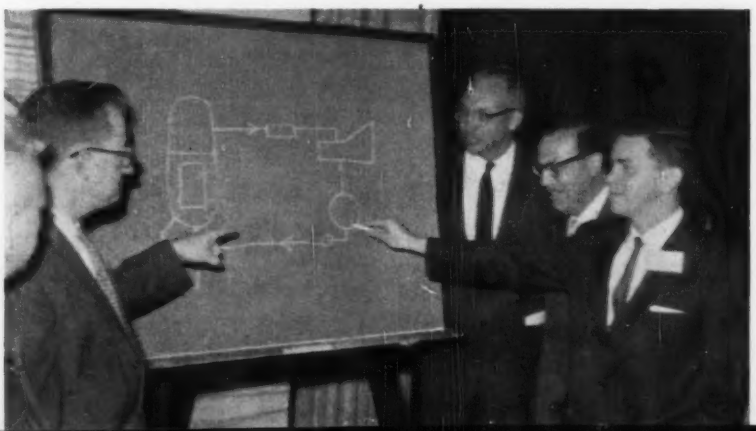
A brushless excitation system that gives promise of eliminating commutators, spare exciters, generator-field breakers, and field rheostats was explained by Westinghouse engineers E. C. Whitney, D. B. Hoover, and P. O. Bobo.

The system provides excitation current to the synchronous-generator field through a rotating silicon-rectifier from an a-c exciter. All components are coupled to the generator shaft. With a permanent magnet generator overhung from the a-c exciter, all excitation power requirements, including regulation, are obtained directly from the generator shaft. The authors anticipate that the new scheme, already in use for smaller applications, such as aircraft, will bring new reliability and low maintenance to electric utility systems that require large quantities of dc for excitation.

A companion paper by R. W. Ferguson, R. Herbst and R. W. Miller, Westinghouse, gave details of the analytical studies associated with design of the brushless excitation system.

Experience with another approach to a commutator-less excitation system for turbine generators was described by W. L. Ringland and W. F. Eagan, Allis-Chalmers. This system uses the rectified output of a capacitor-excited induction generator to excite the main generator. The system has been successfully applied to eight installations, since 1954.

CHALK TALK following the nuclear session brings together (L-R) L. F. C. Reichle, Ebasco; J. M. West, Gen'l Nuclear; Session Chairman A. Y. Taylor, Jackson & Moreland; G. H. Bosworth, Bechtel; and C. A. Hatstat, Sargent & Lundy



Expansion Sp

Steps toward computer analysis of problems reported. Transmission engineers turn to models for lightning tests

Integration of new generation into the system becomes increasingly complex with system growth. And planning engineers seek better ways to factor transmission and interconnections into their evaluations of alternative plans. One outgrowth of this new planning perspective has been the Westinghouse-Public Service E&G task force which made five progress reports.

Expansion planning of an electric utility must reflect formulation of alternative policies, selection of suitable patterns for each policy, evaluation of plans applicable to each pattern, and strategic selection of the best plan, said D. N. Reps, Westinghouse, and J. A. Rose, Public Service. They stressed the importance of realistic growth forecasts in justifying investment for efficient generation, and the loss if growth fails to meet expectations.

Production cost can be forecast with high accuracy by use of a new digital computer program, said J. A. Rose in a companion paper coauthored by C. H. Hoffman, also Public Service, and K. M. Dale and W. H. Ferguson, both Westinghouse. This program applies "gaming" to a flexible mathematical "model" of the basic steam system which can be modified to include hydro and pumped-storage. Basic approach is "stacking" energy producing units according to a predetermined priority to satisfy the expected load-duration curve as adjusted for spinning reserve. If all available units are assigned before load requirements are satisfied, he said, the program draws on interconnections for the deficiency.

L. K. Kirchmayer, General Electric, urged that approximations in the method be explored before it is applied to other systems. He critisized omission of incremental costs, part-load operation, gas turbines.

Decisions to add generation or interconnection capacity are based upon comparison of daily availabil-

Spurs New System Planning Concepts

ity and spinning indices with statistical limits which include a factor for customer dissatisfaction, continued C. H. Hoffman and R. G. Hooke, Public Service, and C. A. DeSalvo, Westinghouse. This dissatisfaction reflects resentment of prior interruptions and load reduction measures. These factors modify an otherwise relatively constant risk of capacity shortage, they said.

System expansion cannot be planned properly without considering interconnections, said C. J. Baldwin, Westinghouse, C. H. Hoffman and J. A. Rose, Public Service, and D. P. Gaver, Westinghouse. This requires a program to reflect outages on interconnected systems as well as on the subject system. And it must decide whether capacity additions should be additional generation or transmission ties to interconnected reserve capacity.

Transmission to connect the generation added in this system expansion, and for interconnections, is planned by still another program, said C. A. DeSalvo and Baldwin, Westinghouse, C. H. Hoffman and W. S. Ku, Public Service. This program, based upon a technique called "fencing", compares transmission capacity out of a station with its generating capacity, or transmission into a substation with the substation's load. Where these comparisons reveal a deficiency, the computer selects the cheapest 138 or 230-kv reinforcement.

CHAIRMAN E. S. LOANE CONSULTS speakers J. A. Rose and C. H. Hoffman, PSE&G, C. J. Baldwin and C. A. DeSalvo, Westinghouse, on computer program

Computer Derives Loss Constants

Mathematical logic underlying a new method of deriving transmission loss formulas from digital load-flow studies was described by E. E. George, Ebasco Services. In George's new method, flow studies are used to construct simultaneous equations that are solved with a sub-routine to get B constants.

Bonneville Power Administration has for two years been processing data for digital load flow studies by machine. H. D. Hurless and W. G. Hegg described auxiliary programs for printing out results on one-line diagrams, analyzing results, comparing cases, and altering the system for succeeding cases. If tabular load-flow data are current, a 250-bus study can be run in two hours, with 8 min of IBM 650 time.

Three-phase and line-to-ground faults for large networks can be economically determined on a medium-size digital computer using methods of a paper by A. L. Toalston, Commonwealth Associates. Acclaimed by discussers as a significant advance, the method uses the short-circuit tensor and symmetrical components with the same assumptions and basic data as for network analyzer studies. Negative impedances and mutual impedances are properly represented.

Still another application of computer techniques to load projection and substation planning, on the B. C. Electric Co system, was detailed by V. W. Ruskin, J. H. Drinau and J. B. Clayton. The computer program was developed to:

- Derive mutually-consistent predictions of coincident-peak generation and of non-coincident Mva at all system points.
- Tabulate the rate of system growth at points within the system.
- Predict substation and bus loads for a-c network analyzer studies.

Transformer impedance tolerance at the nominal tap should be reduced to $\pm 5\%$ to facilitate relocation in rapidly growing systems, urged George W. Iliff and Fred A. Allehof, Bonneville Power Administration. Although 75% of units studied meet this requirement, larger variations in some produce mismatches exceeding 20% between paralleled transformers.

Models Test Tower BIL

Lightning performance of proposed transmission structures can be predicted by surge tests on geometric scale models, reported F. A. Fisher, J. G. Anderson and J. H. Hagenguth, General Electric. Results, with oscillograph time speeded up to match the model scale, agree well with recent calculations which include magnetic effects of the return strike and fields produced by the leader. The model method thus serves as an analog to solve intricate calculations, giving more dependable results than the AIEE or surge impedance methods.

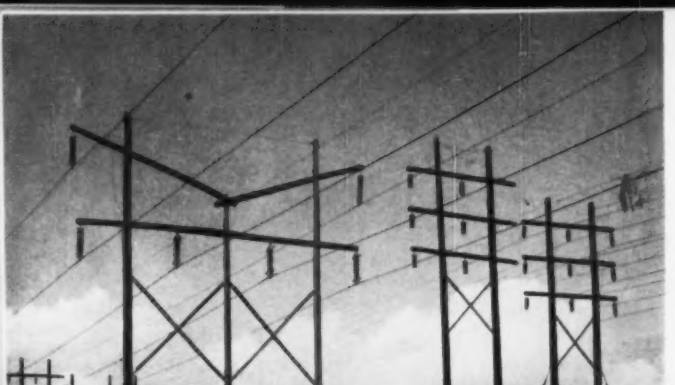
Field measurements of lightning strokes on transmission structures can include wave shape when they are made with a new recorder called the "Teinograph," said J. G. Anderson and R. U. Giacomoni, General Electric. This device feeds a portion of the surge picked up by a coil on the tower leg through an L-C delay line to a series of electrodes, then with an auxiliary delay line triggers the recording of electrode potentials by Lichtenberg figures.

Ice thickness is fairly constant on medium and large conductors but up to 20% less than that which forms on small conductors, said

(*Continued on page* 60)

Crew Supervisors Ca

- **Foremen bear responsibility for preventing carelessness and property damage by crews**
- **Contacting property owners before crews enter land stimulates cooperation**



WITH MORE RIGHTS-OF-WAY passing through areas devoted to residential development or under cultivation, efficient handling of problems during construction is a must

EDWARD J FORD, Senior Construction Manager, Stone & Webster Engineering Corp

Damage claims and poor public relations caused by carelessness of construction crews along rights-of-way can be greatly reduced by proper communications with property owners and workmen.

There are several ways of attacking the problem. One method is illustrated by the instructions issued to Stone & Webster engineers and supervisors:

1. At the beginning of a job, impress every man in the crew that preventing damage to the owners' property must be one of the first considerations.

2. Complaints and damage claims are, in large part, caused by the same factor involved in most personal accidents—carelessness. Treat prevention of damage to property as you would treat prevention of accidents. Make your line-crew safety meetings an occasion to talk about it.

3. Make it a practice to discuss property damage frequently with your foremen. Let them know you intend, through them, to make each crew man realize the importance of watchfulness and be equally attentive to repairing any damage.

4. Insist that each foreman, or at least the general foreman, contact each property owner before the crews enter his property. This is a most effective procedure. The foreman will be surprised at the concessions he can obtain with a friendly approach of this type.

5. Have the foreman call on the property owner again when the crew quits the property to see that everything is satisfactory.

6. Make a systematic check of all rights-of-way where construction has been completed and correct all irregularities in gates, fences, or other property.

Because compensation for damage claims—frequently representing large sums of money—increases construction costs without producing any positive benefits, it is a complete loss to the utility. Primary responsibility for preventative and corrective action falls on the construction engineers, who have direct contact with the job and the men. Although much can be done by developing appropriate relationships with adjacent property owners, any benefits from these efforts can be negated by careless acts of construction crews.

The majority of damage claims involve either live stock or crops. For example:

1. Injury to animals which fall into unprotected holes. This can be avoided if pole-setting crews carry temporary wood covers for holes which must be protected overnight.

2. Loss of live stock because damaged fences have not been repaired.

3. Loss of live stock caused by failure to close permanent or temporary gates at the end of a day's work.

4. Destruction of crops by live stock escaping into adjacent fields through open gates or damaged fences.

5. Damage to crops by equipment or personnel.

6. Damage to dikes and other protective devices which prevent flooding of crops in irrigated areas.

With a better understanding of the rights and privileges involved in a right-of-way, most crew men will be more considerate of the property of others. It is especially important that both general foremen and crew foremen be alert to the problem and caution the men frequently about their actions.

A right-of-way for a transmission line entitles the construction engineer to enter the strip of ground and

Can Limit R/W Damage Claims

construct a finished line. It does not entitle anyone to wilfully destroy crops or damage property on the right-of-way. There have been instances where workmen have deliberately plugged numerous watermelons to find the best one for eating on the spot.

In a majority of cases, the land owner registers his complaint directly with someone on the job site. This is a verbal expression of his feeling against what he considers an overt and unnecessary act by construction crews.

Complaints Must Be Followed Up

Unfortunately, he often does not even inquire for the person in charge, but is just as well satisfied to tell his troubles to the first crew man he meets. This could be a lineman's helper. Yet the owner expects to get immediate assurance that something will be done. This is exactly where 90% of the trouble starts.

The principle reason is that most construction men are not diplomats. This qualification is not required when they are placed on the payroll. But a foreman can be expected to develop such abilities and to require his men to keep him informed of any complaints by property owners. Foremen should follow up each case and try to keep the complaint from developing into a damage claim.

The attitude of the construction people when first talking to a property owner has much to do with the owner's subsequent action and the amount of claims presented. Experience has taught that courtesy is the prime factor in dealing with people.

The next most important is to keep any promises made to property owners. If you see that you can not keep your promises, make it a point to let them know that.

Next in order is the importance of taking immediate action wherever possible to alleviate the cause of the complaint. In some cases it would be foolish to attempt corrections, because the crew would be returning to the same ground a short time later, and any corrective efforts would be more or less invalidated. This, however, should be explained to the owner at the time the subject is brought up.

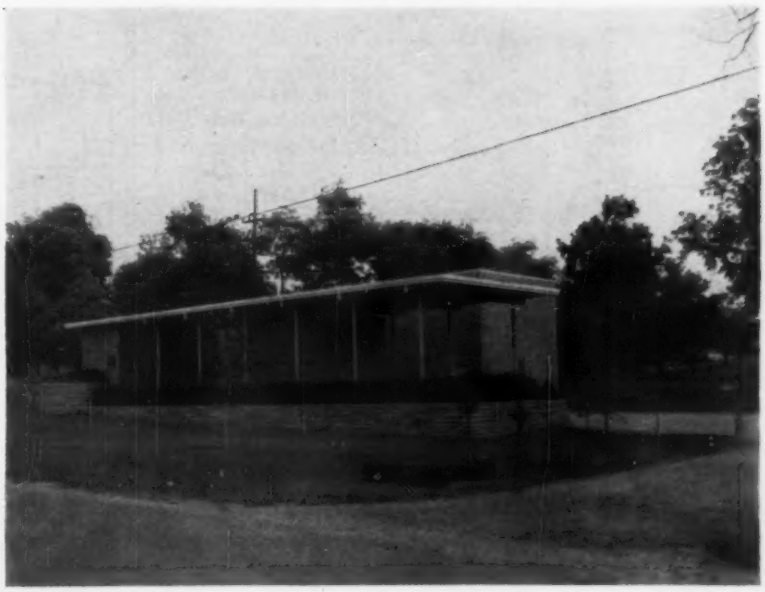
As long as a case remains on a complaint status, the property owner is in a much more favorable humor to carry on negotiations than he may be if his complaint is ignored and he resorts to filing a claim. A man filing a claim usually is in an angry mood. This is invariably reflected in the amount of money he demands in compensation.

These claims are often beyond the realm of reason. Consequently, construction engineers must review each claim. An investigation must be conducted at the site to determine if the amount demanded is in keeping with the extent of damage.

All this requires a considerable expenditure of time by several people. And they must be responsible people. In many instances, engineers, supervisors, and foremen are called into such investigations at times when they can ill afford to be taken from their normal duties. Right-of-way people are always required in claim settlements, and it is common knowledge how much their efforts are needed in the pursuit of their normal duties.

Contemporary Substation Design Matches Area

JAMES B. OLIVER, Project Engineer, Detroit Edison Co, Detroit, Mich.



Acceptable appearance at lowest cost was the objective of Detroit Edison Co in adopting a contemporary design for their Mohawk Substation, which is located in a new residential area. The substation is adjacent to a new high school, also of contemporary design.

A roof integral with the control center building extends over outdoor metal-enclosed switchgear. Transformers are within masonry walls to insure low sound levels; enclosures are open at the top to permit ventilation. Present capability of the substation is 5,000 kva, with a design ultimate capacity of three 10,000-kva transformers and 14 outgoing 4.8-kv circuits. Subtransmission supply is at 40 kv.

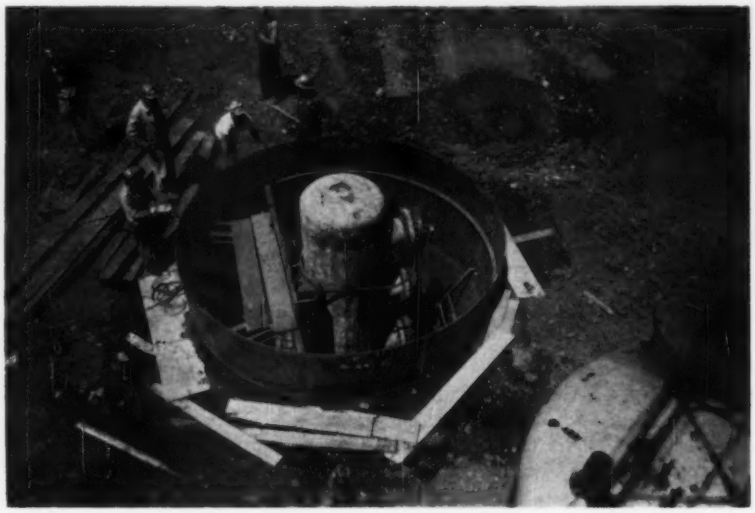
Cut BWR Containment Vessel C

Sargent & Lundy tests show that cold water in shell will minimize pressures, lower vessel construction costs

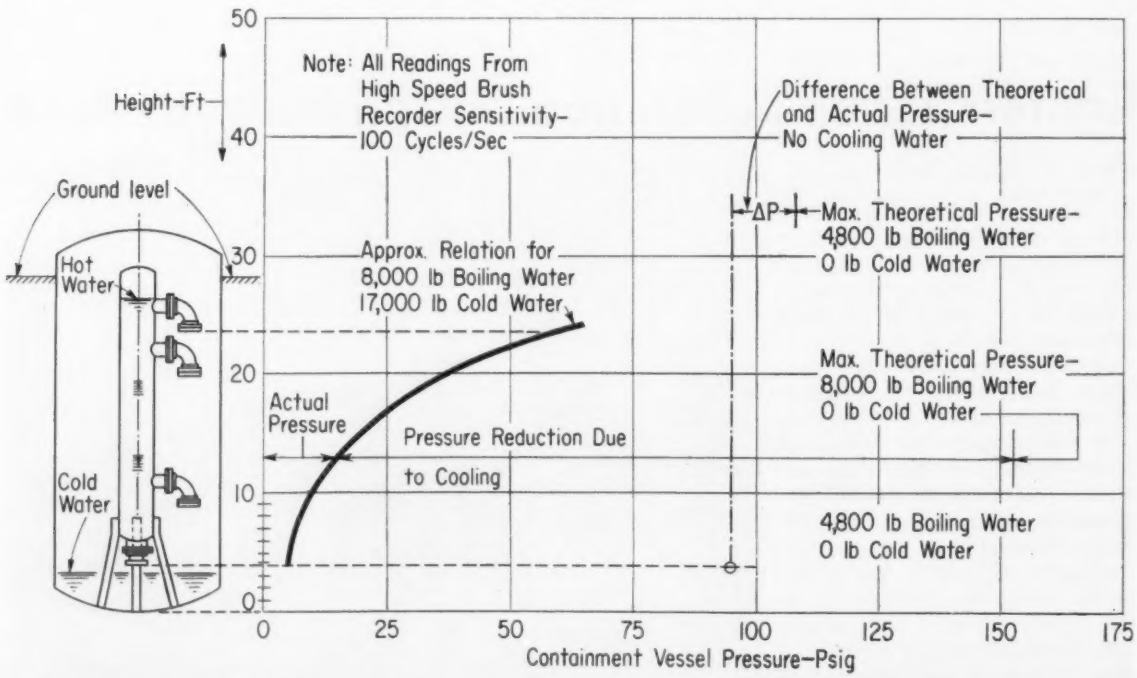
Containment vessels for boiling water reactors can be reduced in size to an extent that makes possible savings of up to 10% in capital costs for the complete plant. Tests recently conducted by Sargent & Lundy show that storage of cold water in a containment shell will minimize shell pressures in case of a nuclear incident by absorbing heat from the escaping steam and water.

The tests, conducted at Illinois Power Co's Hennepin Station (EW July 27, 1959, p 54), were directed at determining the feasibility of drastically reducing containment shell size by putting cold water in the shell. The heat of steam released by a nuclear rupture would be spent in changing storage water to steam, suppressing pressure in the containment vessel. This permits use of smaller containment vessels with obvious economies.

Using the data obtained, Sargent & Lundy developed a concept for a boiling water reactor plant using a small containment shell enclosed in a conventional building. Savings in investment costs for a plant such as Argonne's 5,000-kw EBWR were estimated at $450,000, or 10% of overall plant cost. For larger plants, it was estimated that savings would be smaller, perhaps as low as 5% of total plant costs.



BOILER DRUM simulating reactor was lowered into containment shell designed for 100 psig and semi-buried. Steam was supplied from the station power plant



BOILING WATER and steam were released from each of the 12-in. openings during various tests. The opening to be ruptured was covered with a diaphragm. Cameras were used to capture rapid variations in instrument readings

el Costs

In the test, an old boiler drum was set up in a containment shell to simulate reactor conditions. The boiler drum, 42 in. dia and 23 ft long, was designed originally for 700 psig. The containment shell was 14 ft dia and 32 ft high and was designed for 100 psig.

The drum and containment shell were installed vertically in the ground with the top of the containment shell extending above the surface of the ground. The installation was 1,200 ft from the plant for safety reasons.

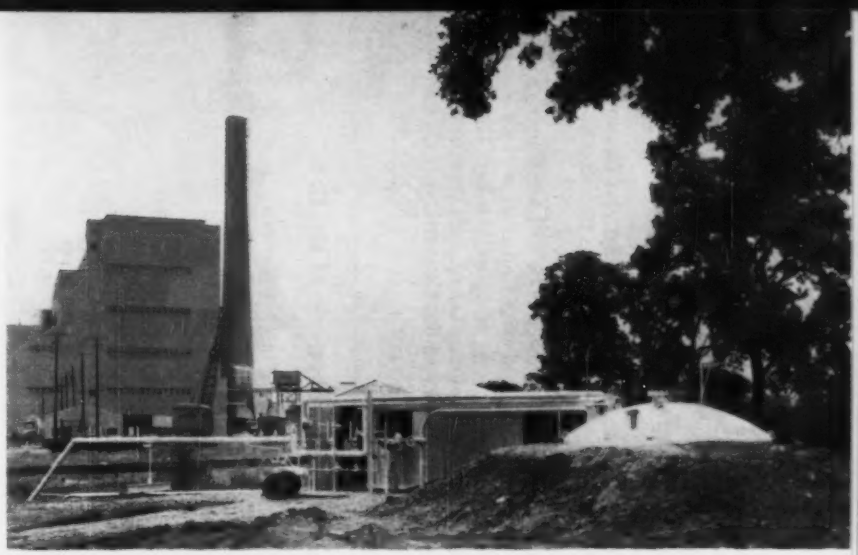
The drum had several 12-in. openings, one at the bottom and the others spaced at vertical intervals along the side. The drum was filled with water which had been heated to boiling at 600 psig by steam from the power plant. Only one 12-in. opening was left open in each test. This opening was covered by an explosion diaphragm designed to break at 600 psig. To control the time when the rupture occurred, a steam-operated triggering device was arranged to puncture the diaphragm.

Instruments Remotely Located

Instruments showing pressures and temperatures for the containment shell and drum were installed in an adjoining instrument house. Because of the speed of action, the instrument panel was photographed during the test. About 16 readings per sec were obtained.

Sargent & Lundy calculations indicated that a ratio of 2.5 lb of cold water should be used in the shell for each pound of hot water in the drum. This would keep the final mixing temperature below 200F and insure against a pressure rise.

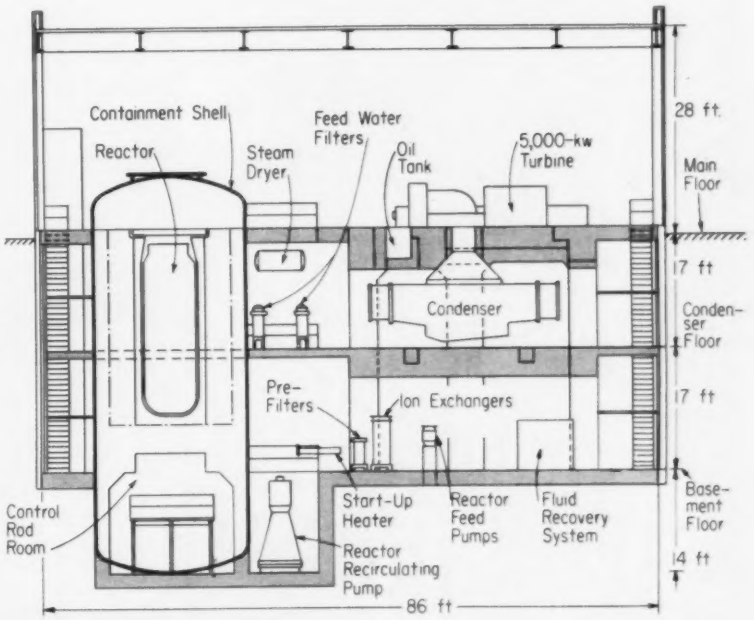
With 3,000 lb of boiling water, 2,000 lb of cold water were used. The pressure rise in the containment shell was 4 psig, compared to a theoretically expected pressure of 74 psig without cold water in the shell. With 8,000 lb of boiling water, 17,000 lb of cold water were used, and the pressure rise was 5 psig, instead of the calculated pressure of 153 psig without cold water. For the 5-sec duration of the discharge, this was equivalent to 500,000 kw of energy released.



TESTS WERE CONDUCTED at Illinois Power Co's Hennepin Station. The drum, seen above at lower right was located 1,200 ft from the station for safety

The first tests were made with the diaphragm at the opening in the bottom of the drum, nearest the cold water. In other tests, the diaphragm was placed at different openings on the side of the drum. As the distance between the cold water and the discharge point of the hot water was increased, the pressure increase in the containment shell became greater.

One test was made to correlate actual pressures observed without cold water in the containment shell with calculated pressures under those conditions. Correlation was reasonably good, with 95 psig actual pressure observed, compared to a previously calculated pressure of 108 psig.



NEW CONCEPT for boiling water reactor station design was developed from data obtained during the tests. A conventional station design could be used, and overall capital costs could be reduced by as much as 5 to10%

Interconnected Systems Link 85% of U.S. Capacity

Twenty power pools and interconnected systems aggregating 142 million kilowatts blanket geographic area of country

Virtually 85% of electric utility generating capacity in the U. S. today is part of one or more interconnected system groups. Twenty such groups, some operating as formal power pools, now exist. They have an aggregate generating capacity of nearly 142 million kw. This figure was arrived at after deducting duplications caused by "groups within groups."

Geographically, these interconnected system groups blanket almost the entire U. S. In some instances, areas outside the country are included, where Canadian and U. S. utilities are interconnected.

Identity and general geographic scope of the interconnected systems now operating are shown in the accompanying map.

Industry usage has been to class all interconnected systems into one or the other of two groups; one it calls simply "interconnected systems" and the other "power pools." Exact and universally-accepted definitions are not available. However, a "power pool" has been described as "two or more electric systems interconnected and coordinated to supply power for their combined requirements and maintenance programs."

Besides this, every pool has two prerequisites:

- An agreement among the members governing pool operations.
- A central office from which the agreement is administered.

What differs from this, to the extent of the difference, is not a pool.

A so-called "interconnected system," on the other hand, lacks one or both these prerequisites. In general, it is a group of utility systems interconnected at one or more points, and operating in synchronism. Whatever power interchange occurs is a matter of voluntary negotiation among the individual utilities concerned. Representatives of member systems may meet periodically as a committee to exchange information on practices of common interest.

The semantics of interconnection are complicated by the fact that two of the older power pools—Connecticut Valley Power Exchange and the Pennsylvania-New Jersey-Maryland Interconnection—have misleading names.

As the map and tabulation show, there are several major system groupings.

The Interconnected Systems Group (not a pool) is the largest. It has an interconnected capacity of 60 millon kw, has over 100 member utility systems, and covers parts of 30 states. Some of its member systems are also parts of eight other pools and interconnected systems. Largest of these is the North Central Area Interconnected Group. It has an interconnected capacity of 20 million kw, and includes the American Electric Power System Pool (not shown) with its nearly 5.5 million kw.

The Southwest Power Pool, which includes the Middle Southern Company Pool, covers parts of eight states, and has an interconnected capacity of nearly 10 million kw. Its members also participate in the Interconnected Systems Group as do members of the Southern Company Pool, the Iowa Pool, the Illinois-Missouri Pool, and the projected Eastern Missouri Basin Power Pool.

Two major utility system groups—the Northwest Power Pool and the Canadian-U.S. Eastern Interconnection—are interconnected with Canadian utilities. These Canadian systems contribute a combined capacity of 11 million kw. The Canadian-U. S. Eastern Interconnection has 33.2 million kw of interconnected capacity and embraces Interconnected New England and the Connecticut Valley Power Exchange, representing 6.8 million kw.

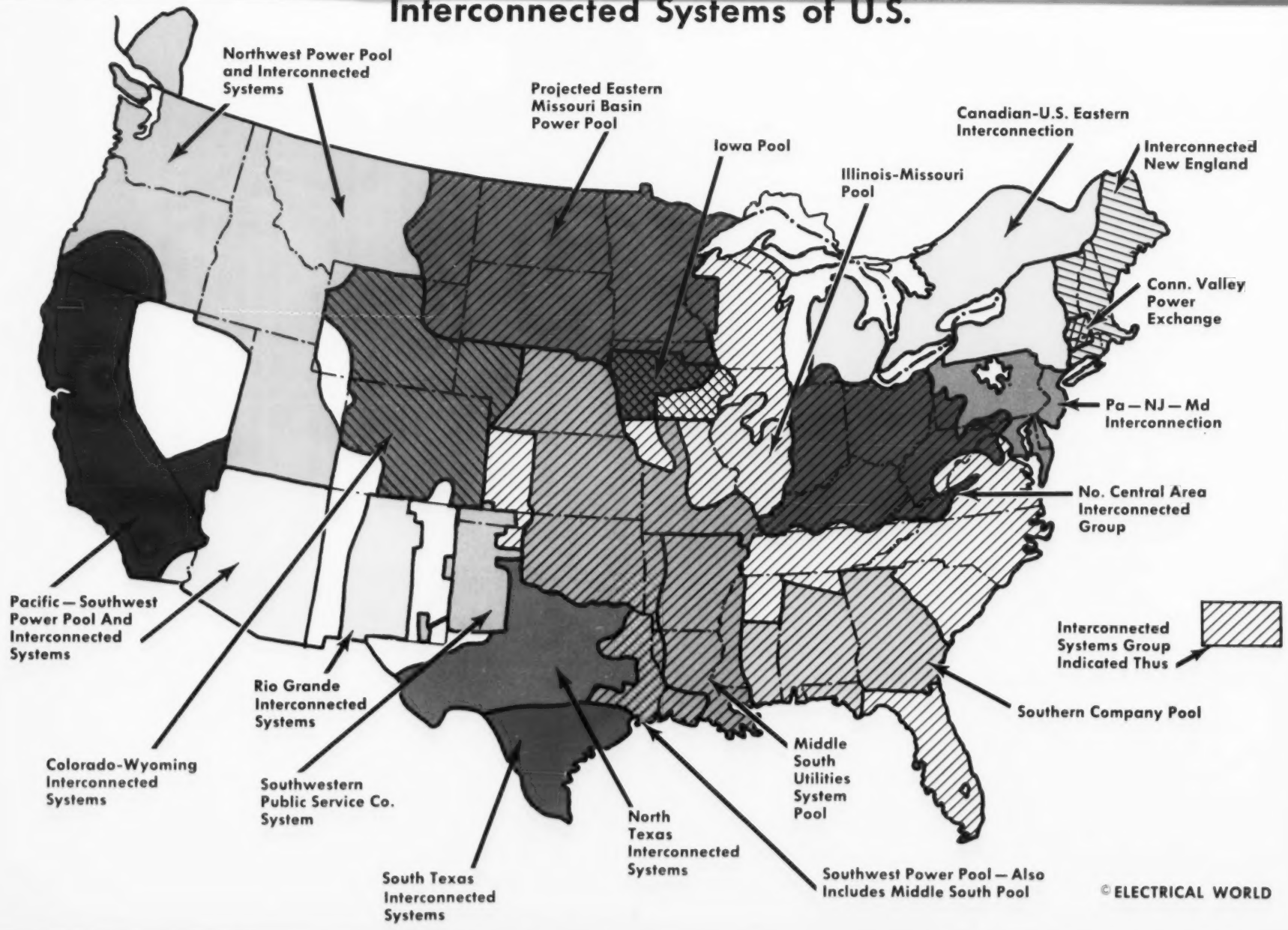
Generating Capability in Interconnected Systems of the U. S.

(Megawatts)

Interconnected System Group			60,000
North Central Area Interconnected Group		20,142	
American Electric Power System Pool (Not on map)	5,432		
Other participants	14,710		
Southern Company Pool		5,061	
Southwest Power Pool		9,714	
Middle South Utilities System Pool	2,550		
Other participants	7,164		
Illinois-Missouri Pool		3,872	
Iowa Pool		1,364	
Eastern Missouri Basin Power Pool (Projected)		5,783	
Other participants		14,074	
Canadian-U. S. Eastern Interconnection			33,188
Interconnected New England		6,800	
Connecticut Valley Power Exchange	800		
Other participants	6,000		
Other Participants		26,388	
Pacific Southwest Power Pool & Interconnected Systems			13,860
Northwest Power Pool			13,170
Pennsylvania-New Jersey-Maryland Interconnection			11,506
South Texas Interconnected Systems			3,897
North Texas Interconnected Systems			3,500
Colorado-Wyoming Interconnected Systems (Interconnected with N W Power Pool)			1,388
Southwestern Public Service Co System			818
Rio Grande Interconnected System			549
Total			141,876
Less Interconnected Canadian Capacity (Est)			11,000
Capacity of Interconnected U. S. Utilities			130,876

Interconnected Systems of U.S.

Interconnected Systems of U.S.


Northwest Power Pool and Interconnected Systems
Projected Eastern Missouri Basin Power Pool
Iowa Pool
Illinois-Missouri Pool
Canadian-U.S. Eastern Interconnection
Interconnected New England
Conn. Valley Power Exchange
Pa — NJ — Md Interconnection
No. Central Area Interconnected Group
Interconnected Systems Group Indicated Thus
Southern Company Pool
Middle South Utilities System Pool
Southwest Power Pool — Also Includes Middle South Pool
North Texas Interconnected Systems
South Texas Interconnected Systems
Southwestern Public Service Co. System
Rio Grande Interconnected Systems
Colorado-Wyoming Interconnected Systems
Pacific — Southwest Power Pool And Interconnected Systems

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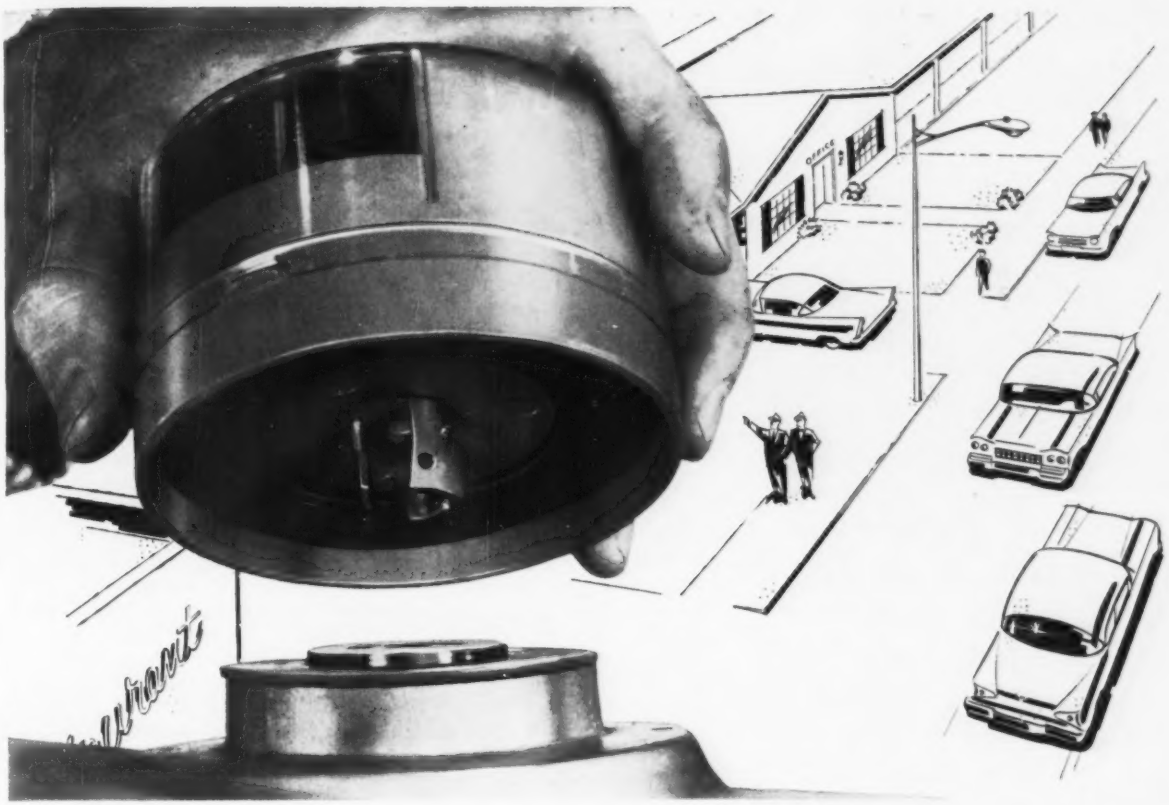


Reliable—after years of tests

New G-E cadmium-sulphide control installs in seconds . . . lasts for years

Now, from General Electric comes the industry's newest, most dependable cadmium-sulphide photoelectric control. Years have been spent in the research, design, and testing of this new street lighting control to produce the most efficient, most reliable cadmium-sulphide control available. Now, after exhaustive testing, the reliability problem has been solved with a custom-built General Electric cadmium-sulphide cell. Shock, surge, humidity, vibration, load, temperature—these were among the tests conducted —but none was found to alter the dependable performance of the new G-E control.

Addition of the new cadmium-sulphide cell is but part of the story. General Electric has developed a new, simplified circuit with specially-engineered long-life components . . . designed and built to work together and to reduce your control costs.

Get the full details from your General Electric Apparatus Sales Engineer or Agent, or write Section 450-25, General Electric Company, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

ADVANCED DESIGN FEATURES give: (1) dependability from new G-E hermetically sealed cadmium-sulphide cell; (2) long life from specially-engineered components; (3) built-in protection from voltage surges; (4) power savings through accurate external adjustment. NO VACUUM TUBES OR RECTIFIERS.

Now... 2 new medium transformer products

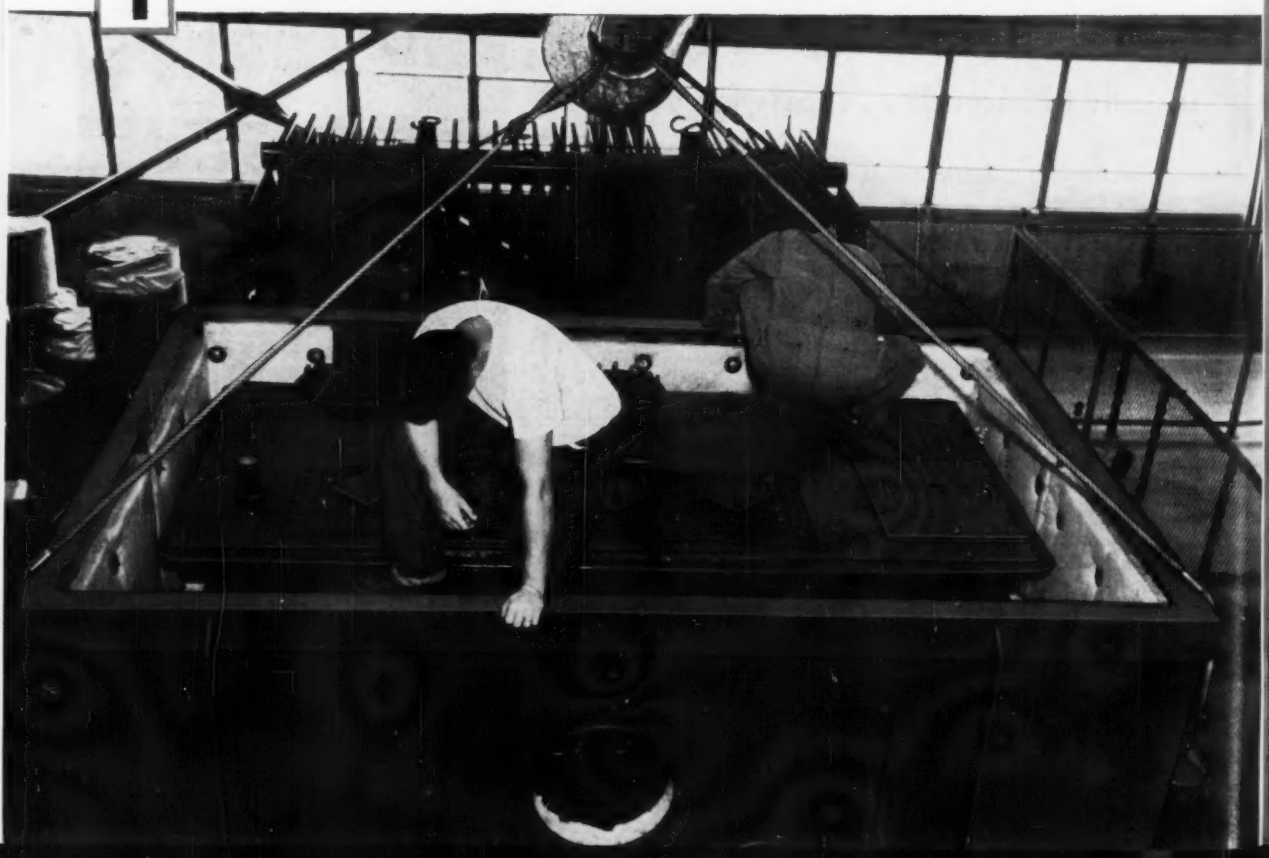
Sound level reductions of almost 20 db and a new low-cost, easily installed substation are making transformer news at General Electric. Lowest sound levels yet for medium* transformers are now available with G.E.'s new pre-fabricated enclosure (also known as "double-wall tank"). And, the reliable General Electric super-compact substation mounts all of the necessary reclosers, lightning protection, fuses, and metering equipment on the medium transformer. Here is what these new products mean to you . . .

PRE-FABRICATED ENCLOSURE. Solving the ever-present problem of transformer hum in residential substations has long been the aim of General Electric transformer engineers. Construction of sound barriers or the use of low-sound transformers often have proved unsatisfactory or too costly. A significant development has resulted from General Electric research in the form of the pre-fabricated enclosure. By placing a pre-fabricated outer tank over a transformer with separately banked radiators, sound level reductions up to 20 db have been achieved.

SUPER-COMPACT SUBSTATION. Reliable, low-cost, easily installed, this G-E unit is the most economical substation for use in thinly populated suburban areas. The G-E super-compact substation has a low-voltage circuit arrangement which is more consistent with normal sub-

* 501 to 7500 kva, 69 kv and below.

1 PRE-FABRICATED ENCLOSURE



from General Electric

station arrangement and application and requires a minimum of adjacent structure. A super-compact substation can be built around any G-E medium transformer.

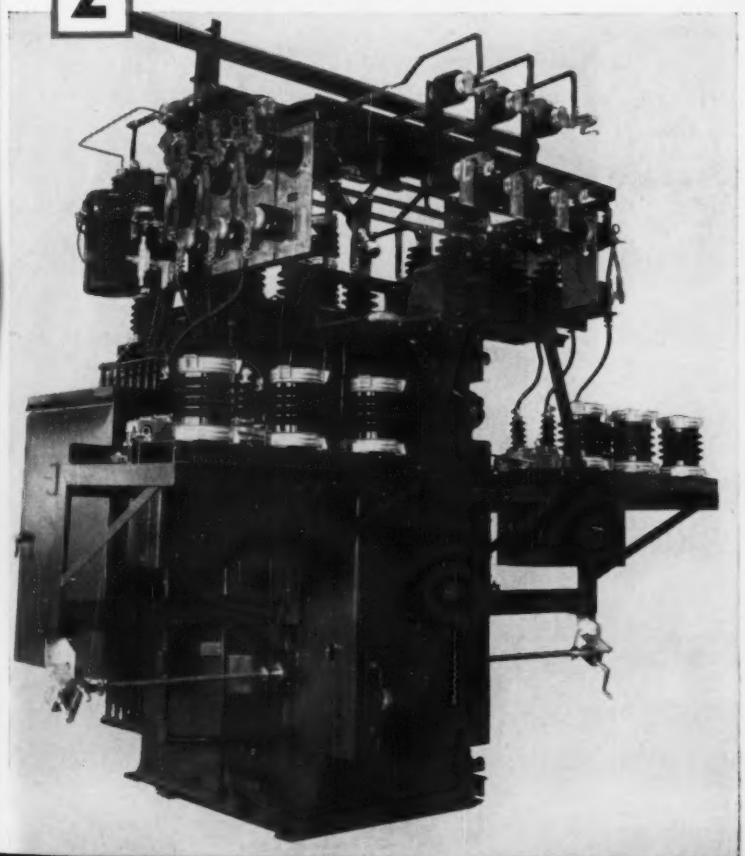
Product leadership is just part of our story. General Electric medium transformers are certified to deliver **full value** for your transformer dollar . . . in terms of superior products . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. When deciding on your next medium transformer, examine the **complete "package"** offered by General Electric. When you do, we're confident you'll recognize G-E superiority and how you get full value for your transformer dollar.

For information or application help on General Electric Certified Full-value medium transformers, see your G-E Apparatus Sales Engineer. General Electric Co., Schenectady 5, N. Y. 416-24

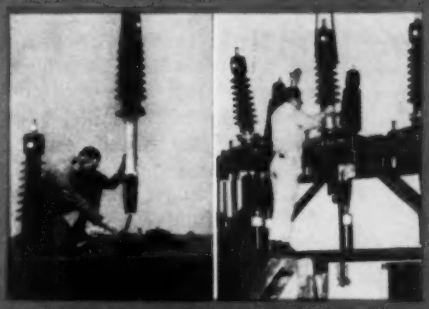
Progress Is Our Most Important Product

GENERAL ELECTRIC

2 SUPER-COMPACT SUBSTATION



FULL VALUE FOR YOUR TRANSFORMER DOLLAR



SUPERIOR DESIGN, FEATURES, AND PERFORMANCE of G-E transformers is typified by new pressure-relief device (above) and interchangeable transformer-circuit breaker bushings (below).

FASTER SHIPMENT through rapid processing of orders . . . computer design capability . . . repetitive manufacturing facilities.

COMPLETE SERVICE . . . application and systems engineers . . . installation engineers . . . of 50 conveniently located service shops.

Expansion Spurs New System Planning Concepts

(*Continued from page* 49)

H. E. House and E. K. Lanctot, Alcoa, E. L. Peterson and E. S. Zobel, American Electric Power Service.

Induced currents in steel members that support a heavy-current bus can reach 15 to 20%, enough to discolor protective paint, G. K. Sebold, Public Service E&G, reported. Currents of this magnitude were measured on the structure supporting Linden Station's generator leads. Some joints in longitudinal members exceeded 302F, with a few bolts becoming incandescent. Losses were calculated at 5.8 kw per generator, he said. Remedies considered for this heating, Sebold continued, were: Insulating the bolted connections, banding the steel members, shielding with parallel loops, and shunting the bolted joints to reduce their resistance. The fourth was the economic choice and ½ x 4-in. copper shunts were welded in place around each joint.

J. L. Grim, I-T-E, and D. E. Buchanan, H. K. Porter Co, both questioned omitting insulation from new structures. James Pitman, Alcoa, suggested use of welded aluminum. But C. C. Paulus, Cleveland Electric Illuminating, asked "Why are the buses so long and the isolated-phase portion so short?"

Energy losses in supporting steel have considerable economic significance, said M. A. Buchta, Gilbert Associates, and N. Swerdlow, General Electric, and there is danger that unexpected hot structures could figure in accidents.

Unbalanced-fault protection for generators connected to a common bus can be provided with negative-phase-sequence relays, said W. J. Kerchner, Jr, Gilbert Associates, and C. T. Abbott, New England G&E. Two steps are involved, the first to open bus tie and synchronizing breakers and isolate all generators from each other, and the second to trip the single generator which continues to show negative-sequence current.

Distribution Sw

New substations take transmission voltage supply, improve 12-kv circuit reliability with coordinated relaying

Larger substations for 12 and 13-kv distribution is a definite trend today, a session on substations was told. East Coast and Northwestern utility engineers described installations in which the only limitation on substation capabilities is the interrupting capacity of low-voltage circuit breakers. In another session, relay engineers heard how coordinated relay schemes protect distribution circuits against interruptions.

B. C. Electric Co's new distribution substations serving metropolitan Vancouver will step down directly from 230-kv subtransmission to 12-kv distribution, said M. B. Callander, B. C. Engineering Co Ltd. Ultimate capability of each station, he said, will be 150 Mva,

WHY G-E FUSE LINKS GIVE MAXIMUM SYSTEM PROTECTION

By D. L. McINTIRE—Lightning Arrester and Cutout Product Planning Specialist

General Electric universal fuse links give you maximum overcurrent protection on distribution systems. Designed for use in every type of cutout, these fuse links are available in fast (K), slow (T), EEI-NEMA Types from one to 100 amperes, and high-surge links up to eight amperes. Ratings of 140 and 200 amperes are available in the solid-head type only.

General Electric universal fuse links offer you these important advantages:

Premature melting is eliminated by silver plating threaded parts to maintain low contact resistance.

Efficient low-current operation is assured by the bonding process and a specially prepared paper in the auxiliary tube.

Fuse withstands continuous overcurrents. General Electric EEI-NEMA fuse links will withstand continuous overcurrents of approximately 150 percent of rating.

Instant separation is assured by new internal spring that prevents cable fouling inside the auxiliary fuse tube.

Drop-out interference is eliminated by the use of a flexible cable. Fine-stranded cable can be used since the G-E fuse element has excellent temperature control.

Like more details? Contact your G-E Sales Engineer today, or write to Sect. 435-23, General Electric Co., Schenectady, N.Y.

GENERAL ELECTRIC

Overcurrents are in

Swings to Bigger Substations, Better Protection

distributed among three 50-Mva, 3-phase transformers, each capable of 75-Mva operation with fans.

Distribution, he added, will take off from two independent 12-kv main-and-transfer bus structures, each having switching positions for 16 300-amp, 12-kv circuits and four banks of capacitors.

This design, said Callander, exploits 4,000-amp, 1,300-Mva, 12-kv circuit breakers, as analysis has shown good overall economy from direct reduction to distribution voltage in very large substations (EW, Aug. 17, p 64). Load growth, he said, will require 12 such substations by 1980, some including three additional 150-Mva transformers to bolster existing 60-kv subtransmission. The latter must pick up 1,800 Mva of distribution load during the same period.

The first 230-12-kv station, Callander continued, is in a residential area, where restrictions on structure height required excavation for equipment foundations several feet below ground. Connecting 230 and 12-kv circuits had to be underground cable. Enclosing the main transformers within specially treated hollow-tile concrete walls satisfied noise restrictions. Radiators are outside the enclosures and are cooled by quiet low-speed fans.

The 135-Mva Downtown Substation was built to augment the 13.8-kv supply to government buildings and the Washington, D. C., network, said M. L. Byrne, Potomac Electric Power Co. Supply to the substation is three 69-kv pipe cables, and there is space for a fourth. Availability of 750-Mva interrupting capability in 13.8-kv metalclad switchgear permitted use of four 37.5-Mva, FOA, 3-phase transformers with 45-Mva emergency ratings, said Byrne. These transformers are paralleled on a six-section 13.8-kv ring bus, each section supplying one feeder to each of four low-voltage network areas.

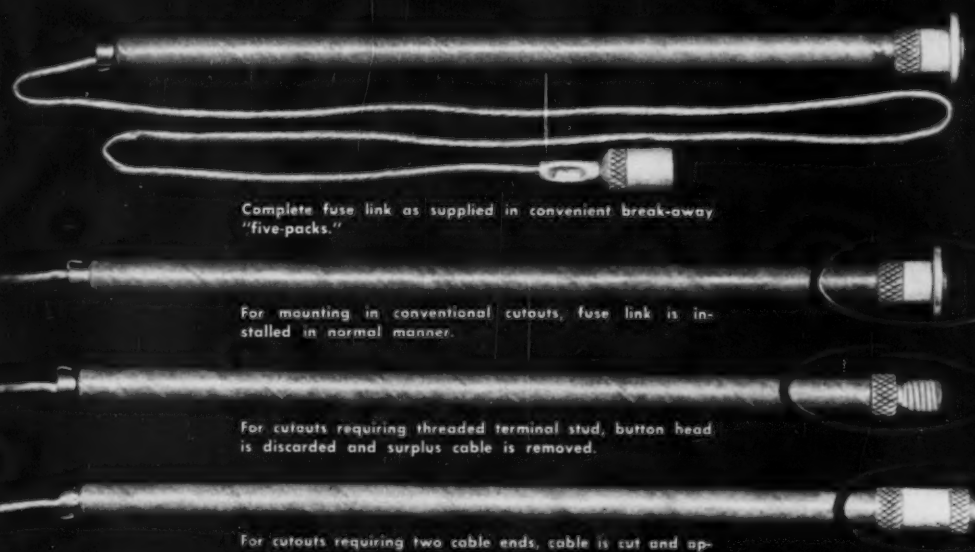
Downtown Substation, according to Byrne, is enclosed in two adjacent buildings designed to comply with Washington's building code. One is essentially a shell over the 69-kv cable terminals, oil circuit breakers, bus, and the four power transformers. Each transformer compartment is cooled by two 15,000 cfm fans drawing air through louvres in the building's front wall and discharging it into open space between the two buildings.

The second building, housing 13.8-kv equipment, has capacitors on the roof, switchgear on the second floor, reactors and station service on the first floor, and cable vaults in the basement.

G. Camilli, L. G. Littlejohn, and W. A. Wooldridge, General Electric Co, predicted that gas-filled transformers will be used increasingly because of their superior safety factors. Arc tests, they said, show that, for the same energy input, the

(*Continued on page* 64)

e interrupted quickly—effectively, by
General Electric universal fuse links



Complete fuse link as supplied in convenient break-away "five-packs."

For mounting in conventional cutouts, fuse link is installed in normal manner.

For cutouts requiring threaded terminal stud, button head is discarded and surplus cable is removed.

For cutouts requiring two cable ends, cable is cut and optional cable-end adapter is threaded onto terminal stud.

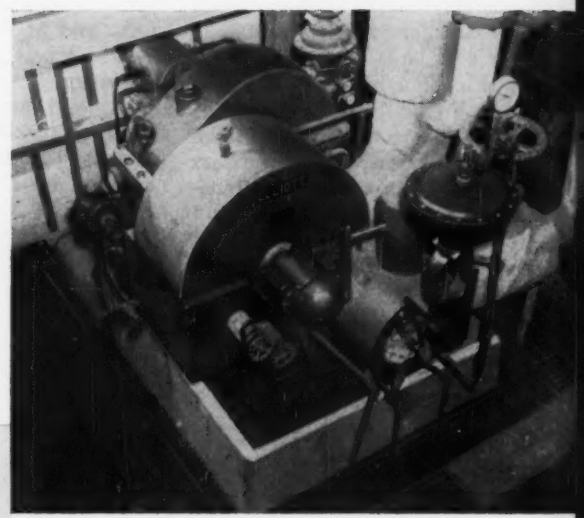
GENERAL ELECTRIC

ELLIOTT TURBINES
since nineteen hundred four

MOTORS
since eighteen hundred eighty eight

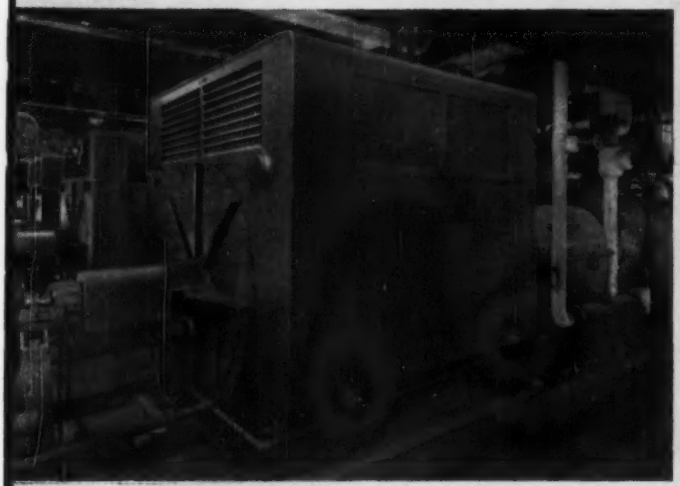
for your auxiliary drives...

Steam or Electric
Large or Small
Indoor or Outdoor

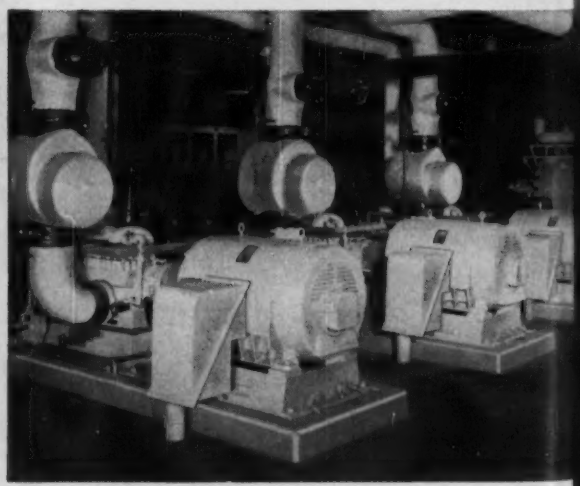


This Elliott geared turbine drives the induced-draft fan serving the 120,000-lb-per-hr boiler for a northeastern pulp mill. Elliott turbines are noted for simplicity, flexibility and year-in and year-out dependability.

ELLIOTT Company
JEANNETTE, PENNSYLVANIA

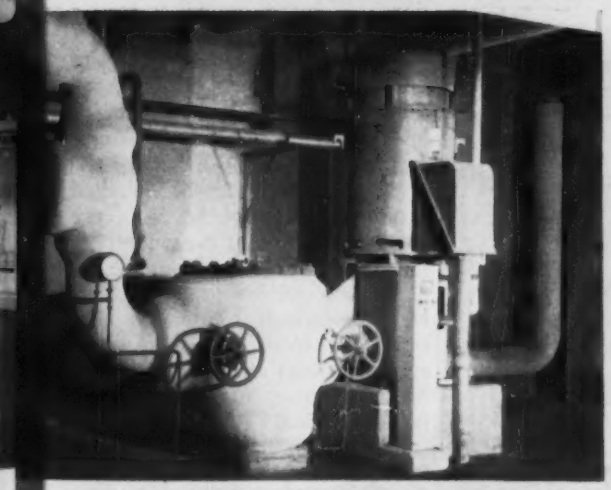


Biggest boiler-feed pump motors in the country—each rated 5000 hp at 3600 rpm. Quick-access openings visible on near end of motor; removable swing-down filter panels on each side. Elliott "Super-Quiet" enclosures. 6000-hp Elliott motors will soon be operating.

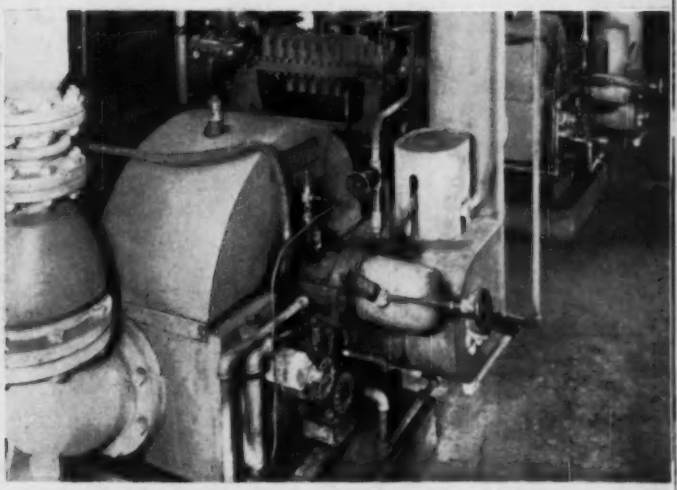


Heater drain pumps are driven by identical 200-hp, 3600-rpm Elliott motors. Elliott water strainers are mounted in pump inlets. Other Elliott products for power plants include condensers, ejectors, deaerating heaters, tube cleaners and expanders.

Dripproof 600-hp, 900-rpm Elliott motors driving line of coal pulverizers. Elliott FABRI-STEEL construction assures structural rigidity; FABRI-SEAL insulation assures maximum service life.



Here an Elliott 250-hp vertical, dripproof motor is shown driving a condensate pump. An Elliott twin basket water strainer which protects the pump can be seen at the left. Elliott C-W motor experience dates from 1888.



250-hp, 3550-rpm Elliott turbines drive boiler feeders in this industrial plant. All major auxiliaries in this station are Elliott turbine-driven. For over a half century, Elliott has been building turbines and turbine-generators.

Distribution Swings to Bigger Substations, Better Protection (*Continued from page 61*)

pressures developed in gases are less than a tenth of those in liquid insulations. The greater compressibility of gases and the small amount of them moved during a fault make pressure-relief devices on gas-insulated units more reliable, they contended, adding that tests also show that gas-insulated units with relief diaphragms are virtually rupture-free.

Phase-isolated load-tap-changer transformers are practical for use in areas where load or power factor is significantly unbalanced from phase to phase, according to a paper by F. P. Kaspar, Oklahoma G&E Co, and J. S. Holtzinger and G. A. Wilson, Pennsylvania Transformer. Providing 3-phase transformation with independent single-phase regulation, this equipment improves customer voltage level, thus increasing revenue from present load.

Supervisory control is as reliable as direct wire systems, even for short distances, and is more economical to install and operate, said G. E. Guy and P. W. Schirmer, GE. Recent additions to space-code supervisory systems enable them to log automatically as well as display data received from remote stations. It maintains an accurate record of the supervisory-controlled system for subsequent analysis, they said.

The American Electric Power System has selected dual coordination as the basis for 12-kv distribution protection, said T. J. Meler and W. H. Johnson. The scheme, they said, uses instantaneous first tripping and reclosing of breakers to clear a temporary fault before conductors and fuses are damaged and then transfers to time-delay relaying for subsequent operations.

The relaying scheme finally adopted, they said, is very-inverse-time-delay relays with separate plunger-type instantaneous relays for the first operation. These relays are set for phase protection to pick up in less than 45 cycles for 40% of the calculated bolted-fault current at the circuit's end or at a recloser sectionalizing the line. Another requirement is a minimum pickup of at least 1.5 times load.

Ground Relays Extend Protection

Ground relays are similar to phase relays, but are set to pick up at 40% of calculated line-to-ground current at circuit's end, they said, noting that the relays' minimum pickup can be as low as half the phase load current.

Meler and Johnson noted that dual coordination has greatly reduced distribution circuit outages. One circuit, protected first by fuses and then by a conventional circut breaker, had 80 outages in 896 days, one every 11.2 days. Adding dual coordination cut this rate to one every 27.7 days.

Dual coordination is extended to longer circuits by installing line reclosers set for one instantaneous and two delayed operations before lockout, they said. Often, single-shot fuses can be used for single-phase branches, coordinated to escape damage during a station breaker's or a recloser's instantaneous operation and to blow during the subsequent time-delay operation.

Coordinated high-speed initial trip phase and ground relays with very-inverse phase and ground relays has enabled Baltimore G&E Co to reclose on 4-kv circuits after 95% of its breaker operations, said W. W. Ward Jr. About 70% of tripped feeders are picked up with no loss of load, compared with 13% with earlier protection. These figures, he said, are a measure of the progress made in clearing transient faults before they burn wires down or blow tap fuses.

These phase inverse relays are set, he said, to pick up at within 60% of the calculated minimum phase-to-phase current, 2.5 times nameplate rating of feeder regulators or other station equipment, and twice the 1-hr rating of underground cable. The corresponding time setting is selected to coordinate with line fuses or other sectionalizing devices. The instantaneous attachment is set for a 3-phase fault at the circuit's feeding point, subject to a 3,000-amp maximum.

High-speed, initial-trip relays are set 0.25 to 0.50 secondary amperes higher than the inverse relays to clear transient faults. Ground relays are set similarly except that calculations are based on line-to-ground fault currents, Ward concluded.

Recent completion of tests up to 20,000 amp available at 6,000 v shows that distribution cutouts can be built for much higher interrupting duties, said R. P. Bridges, Hubbard & Co. Fault current is limited as much as 40% by arc resistance in the small bore of the cutout.

Each utility should determine for its system conditions, the most suitable distribution transformer loss ratio and total loss, then reach agreement with other utilities to set optimum values for future manufacture, advised K. W. Klein, Cleveland Electric Illuminating Co. He found lower annual costs for transformers having loss ratios of 2.0 or less than for today's designs for loads over 35% load factor.

BRONZE MEDAL FOR ENGINEERING EDUCATION is awarded by S. R. Warren Jr to MIT's Dean G. S. Brown. W. A. Del Mar, Phelps Dodge, holds Habirshaw Award and F. B. Silsbee, Leeds Award for Dr. H. A. Brooks, Bureau of Standards

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All
Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

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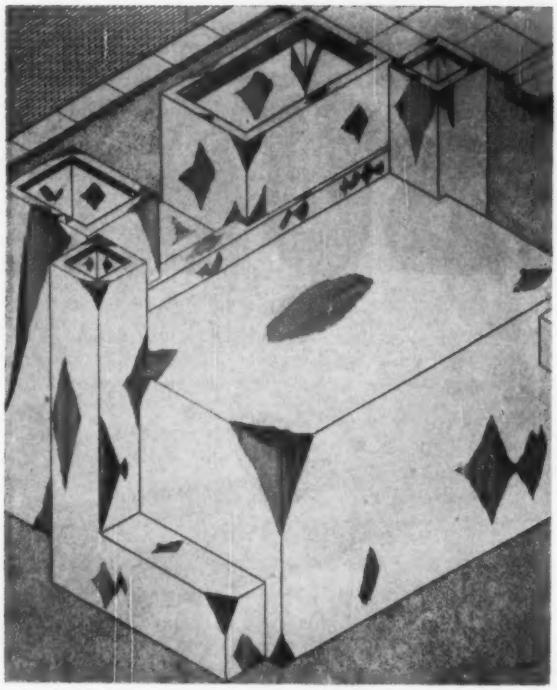


INTAKE DUCTS are incorporated into design. Air is brought in through small and discharged through larger shafts

Positive Ventilation Cools Vaults

J. W. MURRAY JR., Distribution Engineer, Southwestern Electric Power Co, Shreveport, La.

Positive ventilation removes heat from Southwestern Electric Power Co's transformer vaults in July and August when sidewalks reach egg-frying temperatures and air conditioning loads peak. Vaults are designed for three vault-type 500 or 750-kva network transformers.

Intake air is brought in through the small shafts, and exhaust air is discharged through the large shafts. With this arrangement exhaust air flows more slowly than intake air. This prevents dust from being stirred up at the sidewalk level.

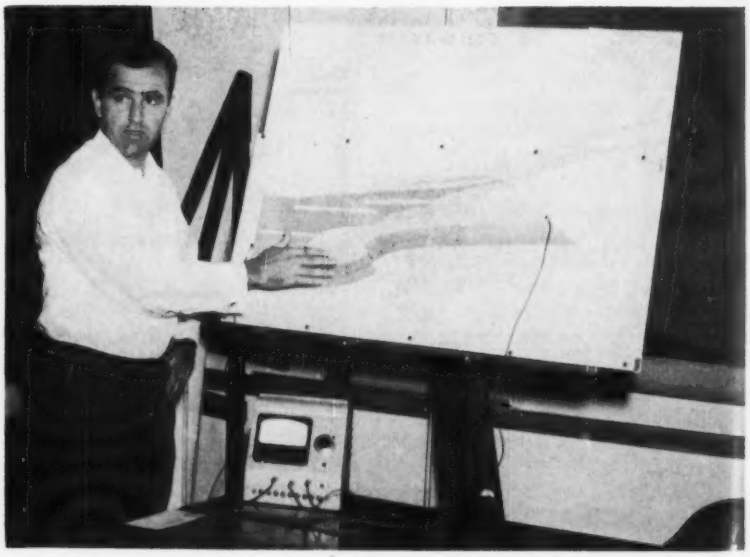
Usually only one or two transformers are installed when a vault is built. In these cases, only one or two fans are installed, and they are placed in the openings farthest from the exhaust ports.

As load increases and a third transformer is added, the other two fans can be installed economically. The higher initial construction cost for fan openings and air ducts more than pays for itself, because portable fans and make-shift ducts are eliminated.

Analog Indicates Reservoir Seepage

An electric analog technique can be used to determine possible seepage from reservoir sites under consideration. David A. DeBruyn, a U. S. Bureau of Reclamation engineer in Sacramento, developed the system to analyze the water-bearing characteristics of underground strata and determine probable seepage losses from reservoirs and canals before they are built.

On the basis of findings by drilling and laboratory analysis, the water-bearing characteristics of the earth under prospective reservoirs and canals are first pictured in graph form as a network of pencil lines on a sheet of acetate. The ability of the network of pencil lines to transmit electricity is analogous to the ability of the underground strata to transmit water. A series of measurements of the penciled graph can determine probable seepage losses.



INVENTOR DEBRUYN demonstrates the analog system. Electrodes placed on either end of the penciled acetate diagram measure electrical conductivity

Now used in transformers and switch gear totaling over 25 million kw capacity

Shell Diala Oil AX has an enviable preference record in the electric power industry. This is due to its exceptional oxidation stability, plus high dielectric strength and low pour point. It all adds up to the utmost in reliability, equipment protection and long life.

Shell Diala Oil AX is inhibited to prevent oxidation . . . it has established new high standards throughout the industry. Actual tests show that Diala® Oil has two to three times greater stability than conventional oils.

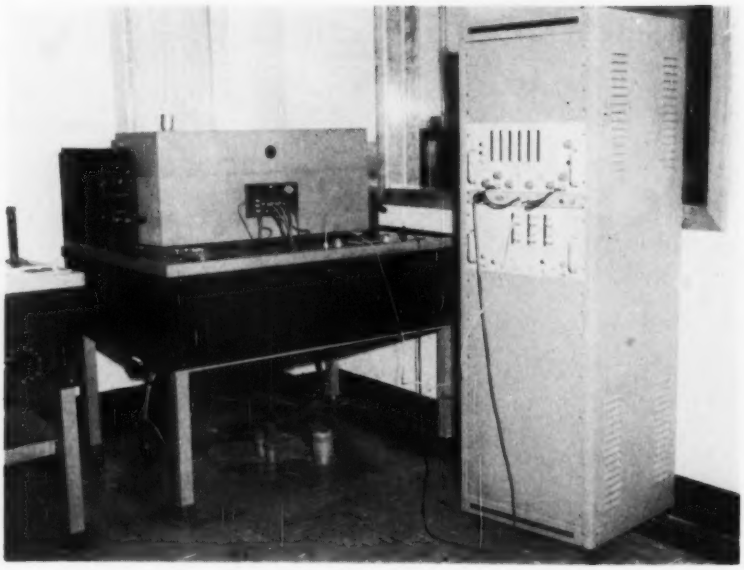
Let a Shell Representative tell you about Shell Diala Oil AX. Write or call: Shell Oil Company, 50 West 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Ave., Toronto 2, Ontario.

SHELL DIALA OIL AX

the inhibited insulating oil

SHELL

Check Meter Standards More Accurately



A. R. JONES, Test Engineer, Long Island Lighting Co, Hicksville, N. Y.

A new method of standardizing reference rotating standard watthour meters, developed by the Meter Department of Long Island Lighting Co, employs a Berkeley preset counter and time-interval meter. These instruments measure elapsed time for a fixed number of rotating standard meter revolutions at a predetermnied load level. Overall accuracy of the new method has been improved to $\pm 0.1\%$ as compared with $\pm 0.2\%$ when using the chronograph, clock, and timer. Moreover, time for standardization has been reduced by 50% with an accompanying reduction in fatigue on the part of the operator.

This equipment replaces the standard clock, electro-mechanical timer and four-pen chronograph previously used. The preset counter and time-interval meter are mounted in a portable relay rack adjacent to a temperature-controlled cabinet containing three rotating standards.

As the rotating standard has a built-in photocell and light source, a pulse is generated each time the hole in the disc moves past the light source. Therefore, one impluse is transmitted to the preset counter for each revolution of the standard. The counter is set to start the time-interval meter after a predetermined number of impulses have been by-passed from "start" and to stop it after a preset number of impulses have been received.

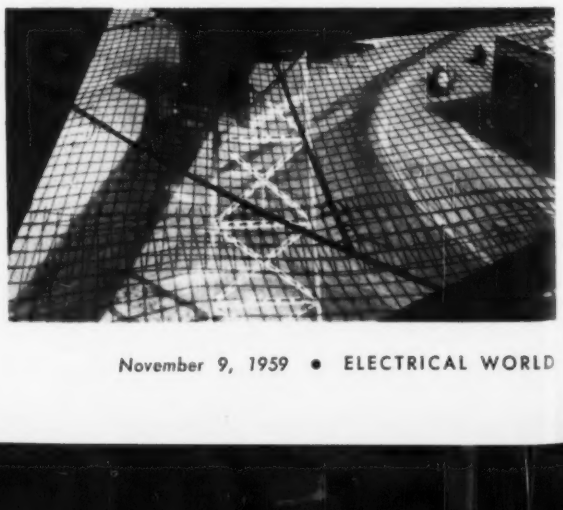
The time-interval meter measures the time it takes for the rotating standard under test to make the number of revolutions corresponding to the difference in number between the starting and stopping pulses. For example, when the counter is set to trigger the time interval meter at the third impulse and stop it at the 13th, the time for 10 revolutions of the standard has been measured.

Accuracy in time measurement is one part in 100,000. There are no start or stop errors because measurements can be made while the standards are rotating. A precisely-calibrated wattmeter is used to measure the load which is controlled electronically through a load regulating wattmeter.

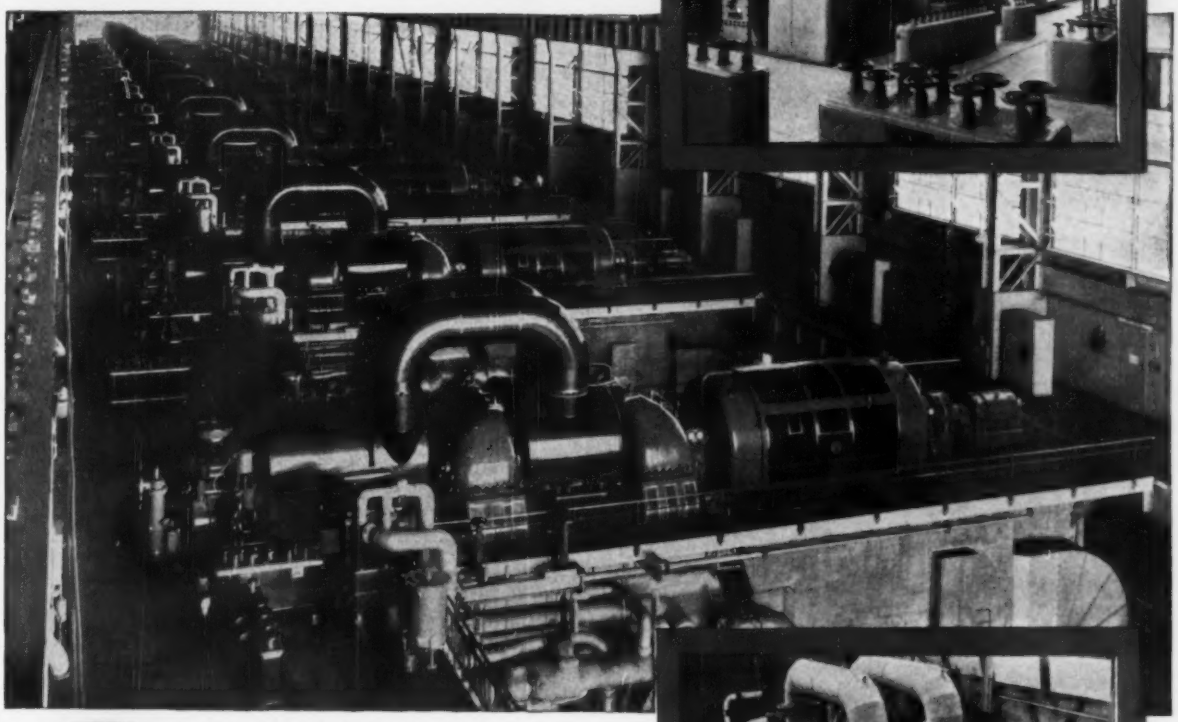
Wire on Conveyor Discourages Pigeons

Pigeons became a nuisance at Detroit Edison's Conners Creek plant when they made a habit of gathering in the shade on the under side of the coal conveyor. Housekeeping was even more difficult than usual. The pigeons lost their interest when turkey wire was installed under the conveyor.

(*More Methods on page* 70)



DEVELOPING WORLD PROSPERITY

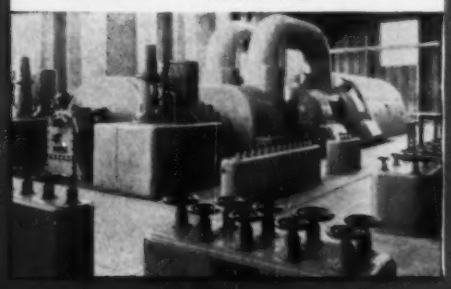


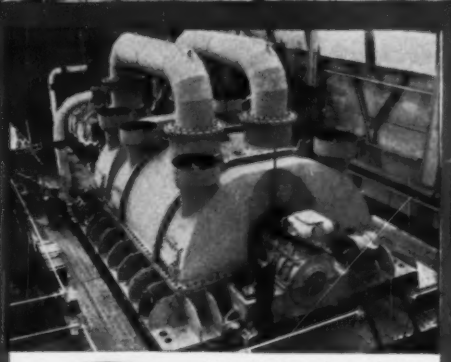
SOUTH AFRICA

Vierfontein Power Station, South Africa—twelve 'ENGLISH ELECTRIC' 30 MW turbo-alternator sets. These sets, running at 3,000 r.p.m., are designed for steam conditions of 600 p.s.i.g., 825°F at the turbine stop valve.

GREECE

St. George's Bay Power Station, Athens. This 60 MW turbo-alternator set and a 14·25 MW topping set have been supplied for the extensions to this station which was originally equipped by 'ENGLISH ELECTRIC' in 1929 with three 15 MW sets.





GREAT BRITAIN

High Marnham Power Station, England. Works tests on the first of five 200 MW, 3,000 r.p.m. three-cylinder turbines which will operate at 2,350 p.s.i.g., 1,050°F at the turbine stop valves, re-heat to 1,000°F.

Backed by over 55 years' experience, 'ENGLISH ELECTRIC' is today manufacturing steam turbo-alternator sets amongst the largest in the world, including two 275 MW units and five 200 MW units for the Central Electricity Generating Board of the United Kingdom. Many hundreds of sets, both large and small, have been supplied to public utilities and industry throughout the world.

'ENGLISH ELECTRIC' products cover all aspects of the generation, transmission and utilization of electric power. Contracts have been completed and others are in hand for many major American power projects.

'ENGLISH ELECTRIC'

Agents: ENGLISH ELECTRIC EXPORT & TRADING CO. LTD., 750 THIRD AVENUE, NEW YORK 17, N.Y. Tel: MURRAY HILL 7-0303

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James I. Metcalf & Co. Inc., 701 United Pacific Building, Seattle 4, Washington. Branch offices in San Francisco, Los Angeles, Portland, Phoenix, for Alaska, Arizona, California, Idaho, Montana, Nebraska, Nevada, Oregon, Utah, Washington and Wyoming.

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OC/US/5

Bridge Handles Breakers in Close Quarters

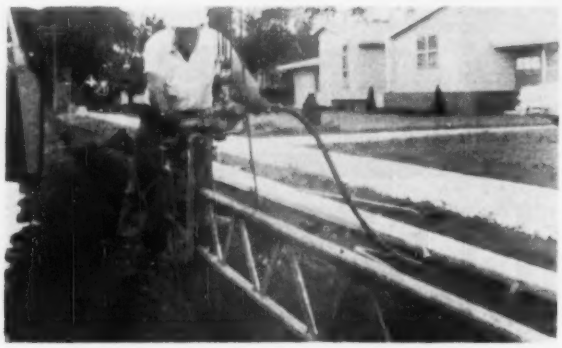
RICHARD MAY, Power Plant Electrical Engineer, Toledo Edison Co, Toledo, Ohio

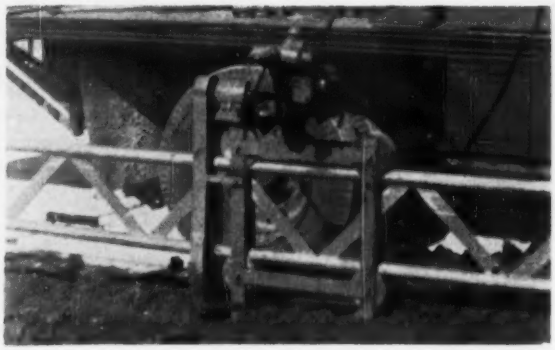
Modification of circuit breaker handling equipment supplied by the switchgear manufacturer enables maintenance crews at Toledo Edison Company's Bay Shore Station to handle these heavy circuit breakers quickly and safely. This improvement has speeded the handling and is considered safer.

Standard equipment supplied by the manufacturer consists of one cantilever beam and hoist unit which can be moved on a track the length of the switchgear. However, the plant arrangement is such that two separate lineups of switchgear are installed face to face with a minimum aisle space between. Thus, use of the standard equipment would require switching the hoist.

This inconvenience was overcome by installing a channel iron bridge (between the two sections of switchgear) which moves on a track and rollers the length of the switchgear. The hoist was mounted on rollers on this bridge.

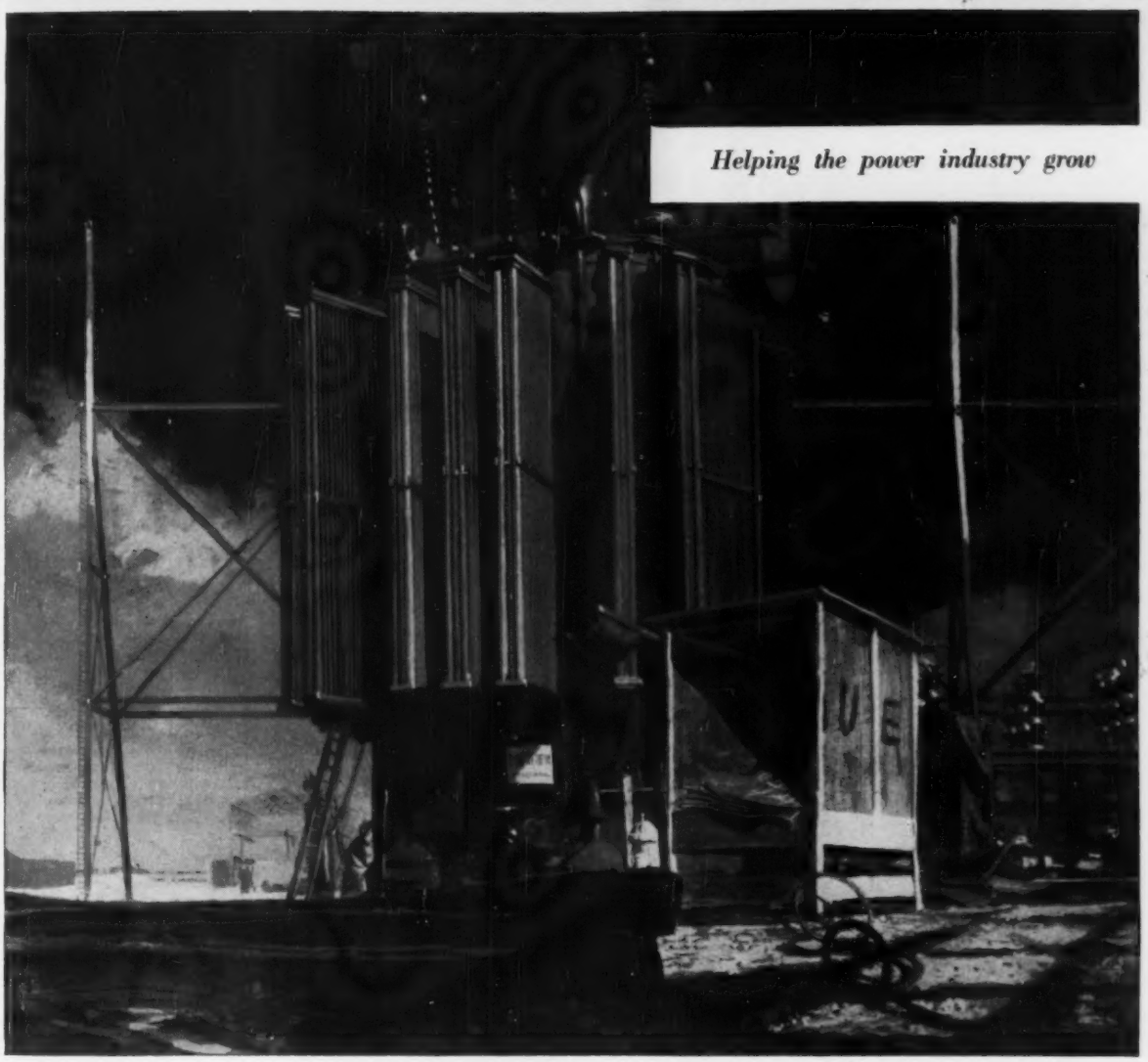
Air Motor Powers Conduit Pusher





To speed up the job and cut the cost of installing street light cable, the L. E. Myers Co has developed a special boring machine for pushing conduit under driveways. The machine was made by using a 14-ft bridge frame with a compressor air motor on top. A chain drive operates a 3-in. 12-ft long auger.

The 12-ft auger is long enough to tunnel under most driveways. However, 8-ft or 10-ft extensions can be added when it is necessary to bore longer holes.



A massive transformer, the slender A-frame of a substation structure, a field construction desk, blueprints and rigging equipment help artist Stanley Meltzoff symbolize the vigorous growth and expansion behind America's electric power industry.

Reservoir of Field Experience

The 75 years' experience of United Engineers has been gained on hundreds of such projects as design and construction of hydroelectric and thermal plants and responsibility for installations that supply heating and process steam. We are accustomed to operate within established budget limits in the design and construction of power projects both large and small. And best proof of the flexibility and scope of our operations—and of client satisfaction—is in our long list of new projects for clients previously served.

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Equipped with a type MH LTC mechanism in which Moloney's rotary type load transfer switch serves as the sole current interrupter leaving the tap selector mechanism arc free.

The load transfer switch also by passes the reactor on full cycling positions thereby eliminating reactor loss and voltage drop.

Connected to the generator through isolated phase bus duct and equipped with forced oil-to-air heat exchangers, the unit makes a compact, unencumbered installation.

MOLONEY ELECTRIC

SALES

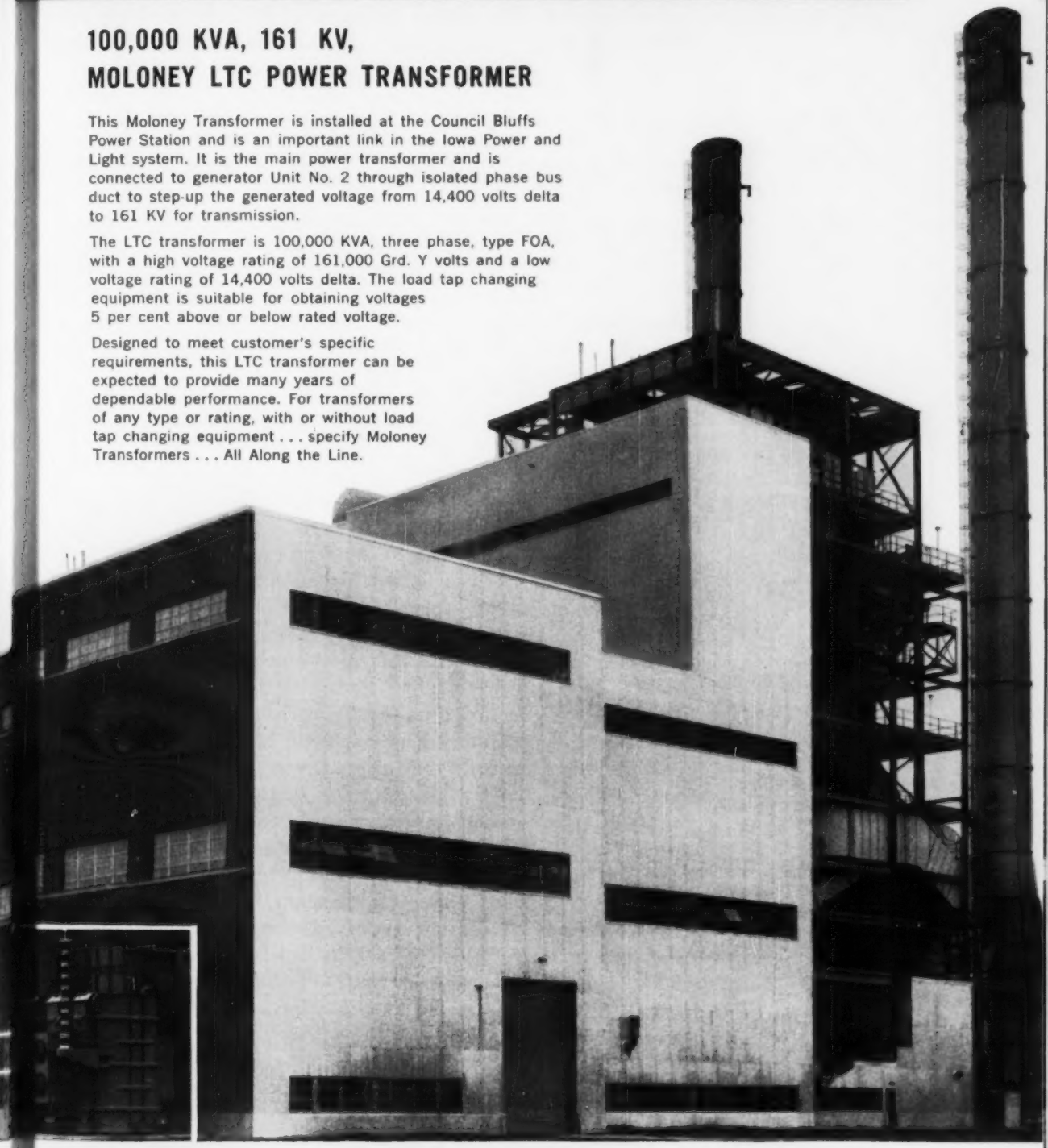
FOR IOWA POWER AND LIGHT COMPANY

100,000 KVA, 161 KV, MOLONEY LTC POWER TRANSFORMER

This Moloney Transformer is installed at the Council Bluffs Power Station and is an important link in the Iowa Power and Light system. It is the main power transformer and is connected to generator Unit No. 2 through isolated phase bus duct to step-up the generated voltage from 14,400 volts delta to 161 KV for transmission.

The LTC transformer is 100,000 KVA, three phase, type FOA, with a high voltage rating of 161,000 Grd. Y volts and a low voltage rating of 14,400 volts delta. The load tap changing equipment is suitable for obtaining voltages 5 per cent above or below rated voltage.

Designed to meet customer's specific requirements, this LTC transformer can be expected to provide many years of dependable performance. For transformers of any type or rating, with or without load tap changing equipment . . . specify Moloney Transformers . . . All Along the Line.



MOLONEY ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Procurement & Products

OUTLOOK ▶ **The year ahead looks very good over-all**—the economy's best in most respects. These are the sentiments of a majority of the 273 economists responding to an annual survey conducted by the F. W. Dodge Corp. Generally, though, these economists see somewhat less vigor in the forward momentum of the economy in 1960 than during the present year. Very briefly, here are some of the highlights from the survey results:

Wholesale prices will creep upward, but not as rapidly as consumer prices.

Expenditures for new plant and equipment will hit about $36.5 billion—an increase of almost 10% above the $33.3 billion estimated for the present year.

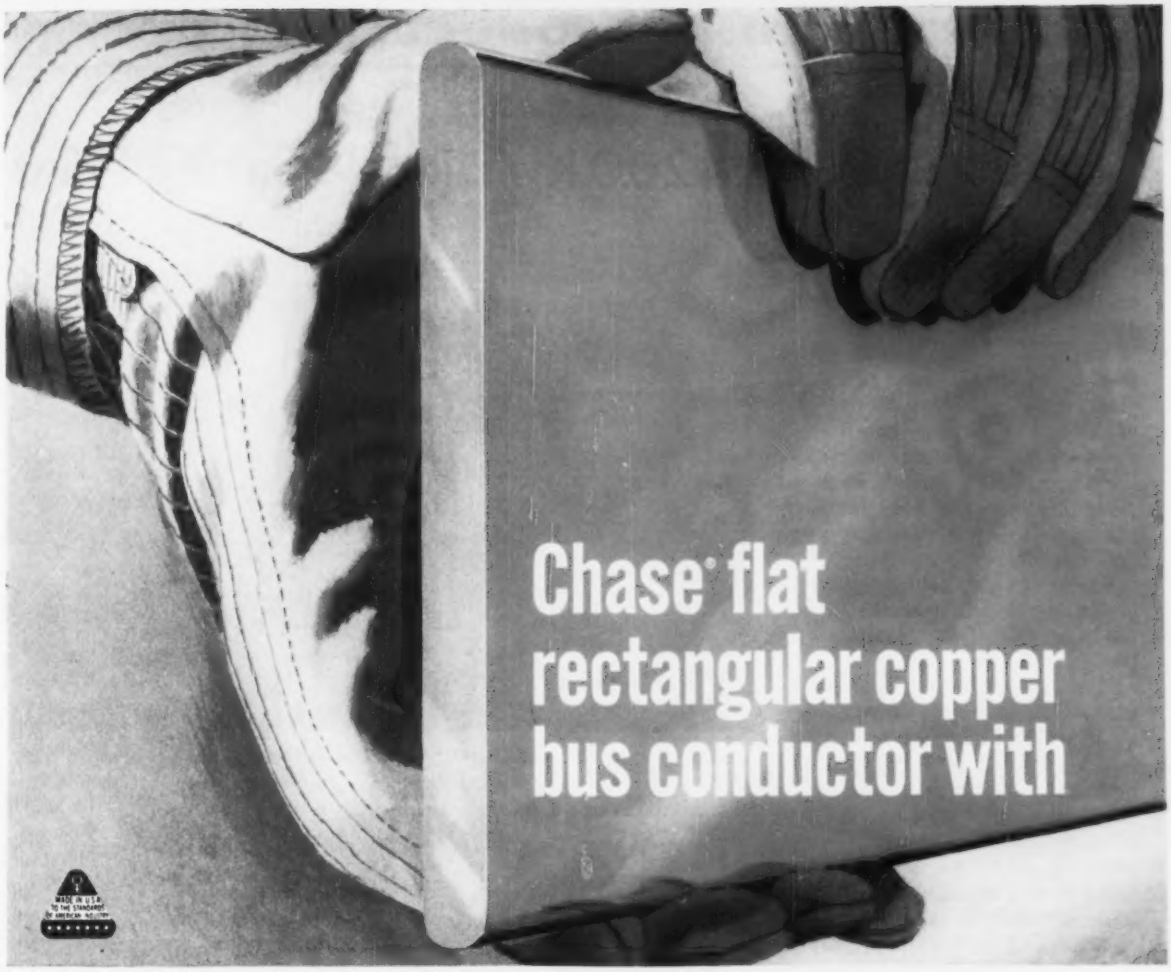
Housing starts may drop from an estimated 1.34 million this year to nearer 1.2 million next—with tight money as chief reason for the predicted reduction.

Interest rates, say the economists, may fall slightly in the last half of 1960, but many are very leery of forecasting in this area.

METALS ▶ **Wire mills are hard hit by the growing copper shortage,** reports Engineering and Mining Journal's weekly markets newsletter. Merchants are asking as much as 39¢ a lb for copper delivered, although there were still some sales at 30¢ a lb. Analysts say increased labor costs are almost certain to force aluminum producers and fabricators to raise prices. And on the steel front, there is the view that the threat of an ore shortage in late winter has been greatly overplayed.

SUPPLIERS ▶ **"Direct from the manufacturer"** is the way most utility purchasing agents buy many items of smaller equipment. In interviews with some 15 utility PA's, Electrical World editors found that all buy distribution transformers and communications equipment directly from manufacturers. Fourteen buy voltage regulators, watthour meters, capacitors, and relays directly. Thirteen buy wire and cable directly. Somewhat fewer buy directly such items as insulators (11), cutouts and switches (11), street lighting equipment (10), pole-line hardware (9). Smallest number purchase trucks and related equipment directly —and here they refer only to truck bodies, equipment, and small trucks. However one medium-size utility maintains a policy of helping local distributors whenever possible, buying only the largest of the named items directly.

News of Manufacturers ..... page 76
New Equipment ..... page 97
Readers Service ..... page 100



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You can get top-quality copper bus conductor from Chase in flat bar shape with full-rounded edges, as well as bar with rounded edge or rounded or square corners.

The full-rounded edge bars have no edges to cut through insulating wrapping and cause trouble on the job. And they can be made up readily in multiple-bar units to handle very heavy direct current loads, or for alternating current.

Chase® flat rectangular, *full-rounded* edge bus conductor is ideally-suited to use in making up bus duct.

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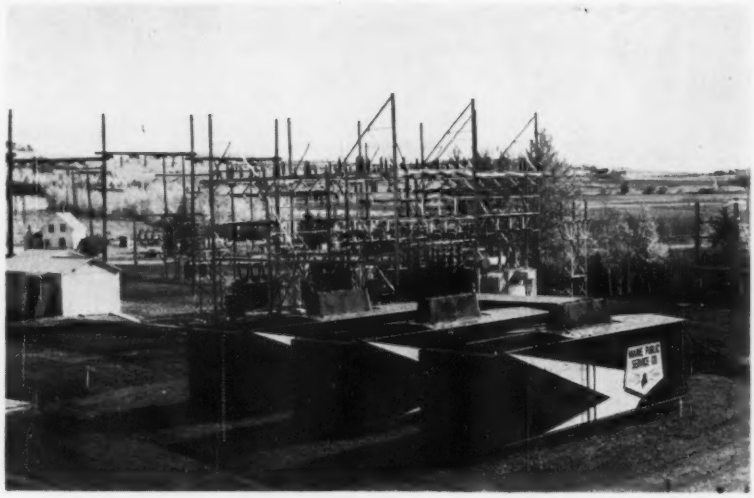
Maine PS Installs 4200 Kw Diesel Peaking Plant

First installation in New England of a new packaged, push-button operated diesel generating plant was demonstrated recently on the system of the Maine Public Service Co at Presque Isle. The new automatic plant, built by Electro-Motive Div of General Motors, consists of three separately-housed diesel-electric units each rated 1,400 kw. They are located at Flo's Inn Substation five miles Northeast of Presque Isle.

The new 4,200-kw facility brings generating capacity of the Maine utility to 48,600 kw against a 44,000-kw winter peak load.

"Addition of this type of equipment to our system not only provides quick peaking and reserve capacity but results in a considerable saving in initial investment over conventional equipment used for this type of service," C. Hazen Stetson, president of the Maine Public Service Co, said at the time of a special demonstration of the equipment.

"Our load pattern is typical of the average utility in which approximately 20% of the total load on peak is required only about 2% of the time. With this specialized equipment lower fixed costs can be realized," he said.



GENERAL VIEW OF THREE-UNIT MU-42 Electro-Motive Diesel generating plant of Flo's Inn Substation of Main Public Service Co. Units rest on a foundation of railroad ties embedded in crushed rock 4 ft deep

Stetson explained that the plant cost approximately $100 per kw installed including the three units and their associated control facilities. Fixed charges were estimated at about $15 per kw per year compared to about $28 per kw per year for more conventional equipment.

In demonstrating the equipment the three power units were started separately and brought on the lines automatically in 90 sec by remote control from Presque Isle under telephone orders from Stetson. Subsequently the units were started up from the site.

Foamed Silica Material Used for Chimney Insulation

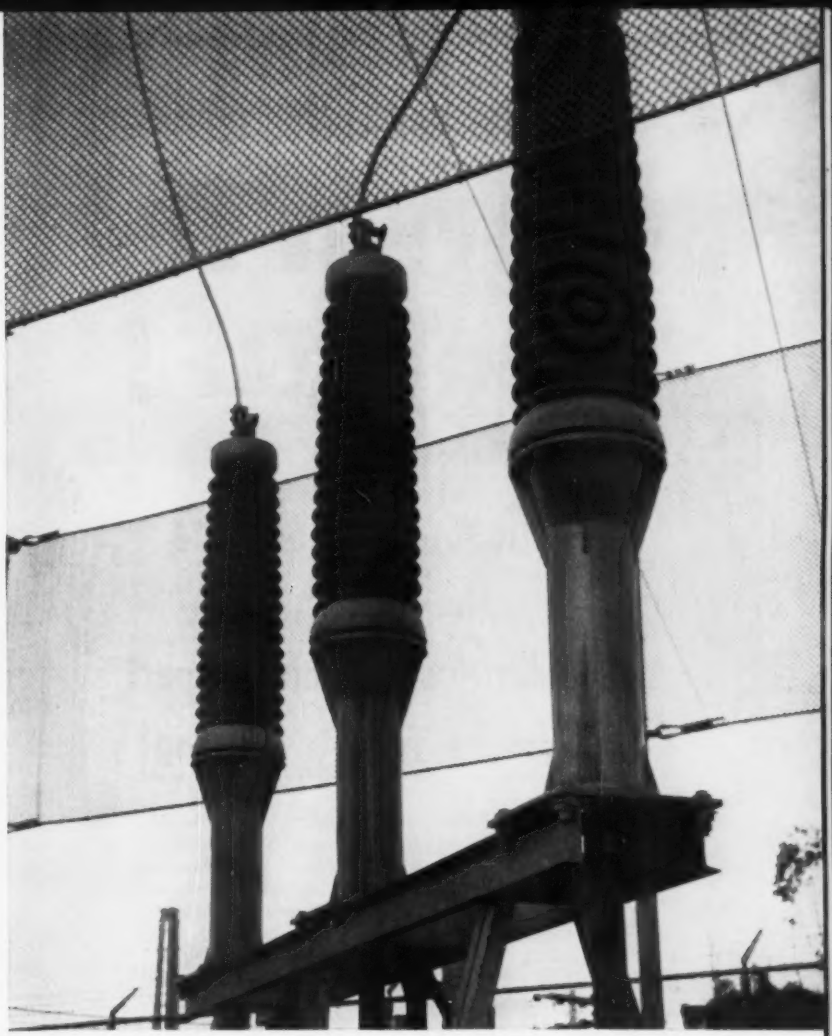
Consolidated Edison's new 500-ft concrete chimney (left) at the Arthur Kill station, Staten Island, N.Y.C., is designed for protection from deterioration caused by high temperature gases.

The M. W. Kellogg Co, builder of the chimney, is using a new foamed silica material, Foamsil, product of Pittsburgh Corning Corp. The material is 99% pure fused silica glass, of sealed cellular structure impermeable to moisture or vapor. The blocks of Foamsil are applied against wall of stack, against a ¼-in. acid-resistant bituminous coating. Joints are sealed with Pennsalt Chemical's Synar silica cement. A half-inch air space was left and an interior lining of one course of acid-resistant brick was erected, principally to protect the Foamsil against abrasion.

(*More News of Manufacturers, p* 78)

ANOTHER FIRST from G&W

"a significant step forward in the termination of high-voltage cable"*



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Two New Computers Feature Fast Calculating

Two companies announce availability of new computer systems: Remington Rand and International Business Machines.

The large-scale, solid-state digital computer of Remington is the Univac Larc, which can perform 250,000 additions or subtractions of 12-digit decimal numbers per second. It enables management to process problems 25 to 200 times faster than on existing computers, says Remington, with the rate of speed depending upon the problems being run.

IBM's small, transistorized computer is the 1620 Data Processing System, which is particularly adaptable to problems relating to power requirements analysis for utilities. It can perform more than 100,000 calculations a minute.

Transfer Cask Car Designed for Enrico Fermi

Baldwin - Lima - Hamilton Co's Eddystone Division has designed and is building a $700,000 transfer cask car for handling nuclear fuel at the Enrico Fermi Atomic Power Plant. Fabrication will be mainly by electric arc welding.

The car will operate over a 100-ft track, running from the building which houses the reactor, to the inside of a storage and decay building.

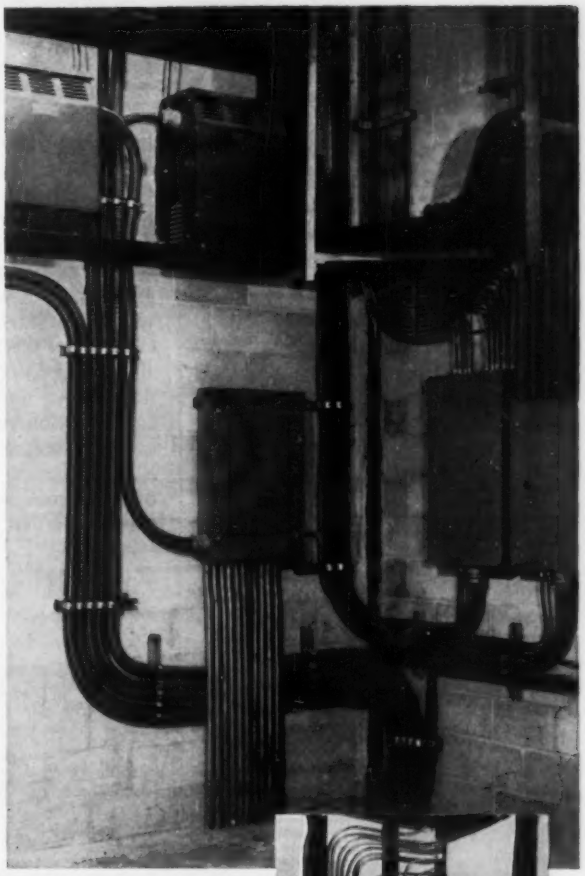
MANUFACTURERS BRIEFS

Westinghouse will furnish three canned motor pumps for a controlled circulation boiler of #4 boiler at Virginia Electric & Power's Possum Point station. The 1800 rpm pumps, each rated at 11,000 gpm, will pump fluids up to 660 F at 3000 psi. A similar canned motor pump has been in operation in conjunction with #3 boiler at the station since June '55 . . . **Babcock & Wilcox** has received a contract to manufacture and install a boiler to serve a 250-Mw turbine-generator of Southern Electric Generating's new steam-electric generating plant near Wilsonville, Ala, the

(*Continued on page* 80)

the right combination for industrial power needs!

Only General Cable manufactures both...



Installation at the St. Regis Paper Company, Jacksonville, Fla. plant.

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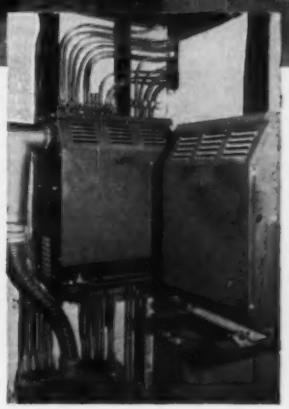
for distribution, control and lighting circuits



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Easy to install in all locations, both Safety M I Cable and Interlocking Armored Cable require no mechanical protection, thus lowering costs of installation and minimizing space requirements. These constructions are easy to train around equipment or structural members, assuring the absolute minimum of interference, and present a neat, functional appearance. In addition, Safety M I Cable has unequalled physical and electrical properties: it is completely resistant to moisture, aging, nearly all chemicals, and operates at continuous high temperatures. For truly modern wiring in your plant, specify Safety M I Cable and Interlocking Armored Cable. And remember; only General Cable makes them both.

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fourth of this type for the station. The first two boilers are slated to go into service in '60, the third in the Spring of '61, and this one the following spring. The four boilers will have a maximum continuous steam output of 6,800,000 lb per hr, at a pressure of 2325 lb per sq in. and a temperature of 1000 F at the superheater outlet. Steam will be reheated to 1000 F . . . **Louis Allis Co,** maker of electric motors, generators and adjustable speed drives, announces it will build a new research and development center near Greendale, Wis. It will be staffed by 100 engineers and technicians, double the number in the present lab . . . **General Mills, Inc** has acquired Mangnaflux Corp of Chicago, a pioneer in the development of techniques and equipment for detecting hidden flaws in industrial materials . . . **Allis-Chalmers** announces lower guaranteed exciting current levels for its entire line of distribution transformers, 167 kva and smaller, in all voltage classes. The new levels, up to 60% below those previously published, have been made possible through improved silicon steel handling and processing techniques, and transformer design changes . . . **I-T-E Ciruit Breaker Co's BullDog Electric Product Div** has a new system for distributing electricity in industrial plants and commercial buildings. Called XL Duct, it is exceptionally flexible, says the company, easy to install, and features plug-in power take-offs at any place along the line without disconecting the main power line . . . **Electric Machinery Mfg Co** has installed three of its new 2500 hp, 3600 rpm induction motors driving boiler feed pumps at Plant #6 of Northern States Power Co's High Bridge station, St. Paul, Minn.

S & C Breaks Ground for $2-Million Lab

S & C broke ground for its new $2 million laboratory which will serve as a research, development and and engineering center for high-voltage circuit interrupting devices (See EW, Sept. 14). The facility, which is located next to S & C's new Ridge Avenue plant in Chicago, will extend the company's research and product development capabilities year-round and enable S & C to better utilize its KEMA laboratory facilities in Holland. In the past, the company has operated a headquarters laboratory, supplemented by a mobile instrumentation lab that has travelled from coast to coast for field testing.

Stage One calls for installation of a 60-Mva short-circuit generator for research in new interrupting techniques. Impulse testing up to 1,200 kv and 60-cps flashover testing to 400 kv will be afforded; also high-current short-time testing with automatic control will be available to 80,000 amp asymetrical. Time-current tests will also be possible.

(*More Procurement & Products, p* 98)

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BUILD LONG LIFE

INTO POWER PLANTS

With costs of downtime constantly climbing, the soundest investments in new central stations today are those engineered for optimum protection against failure tomorrow.

This is one of the reasons why The M. W. Kellogg Company, worldwide engineers and builders of plants for basic industries, is so frequently charged with the execution of large capital expenditures by electric utilities—one industry vital to all.

In central stations functioning 24 hours every day, a major Kellogg responsibility is to install and weld the hundreds of feet of heavy-walled main steam lines that keep steam flowing to the turbines, as well as much of the auxiliary piping.

Through Kellogg's metallurgical background and the company's development of special field-welding techniques, the security of Kellogg K-Welds® on stainless, chromemoly, and high quality carbon steel piping is assured for the life of the steam generating system.

Kellogg's role in the erection of one major utility's newest power station is fully described in the 12-page booklet—"The Eddystone Story." Inquiries for this booklet are invited from consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

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introduces POWER

. . . 1. a plan to predict future system needs accurately
. . . 2. a program of product development for generation, transmission and distribution geared to the needs of future systems

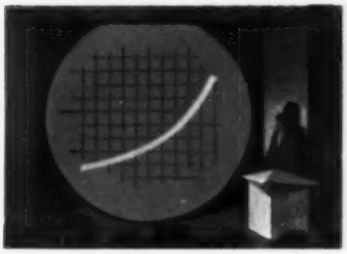
Pushbutton living for millions of people can bring a 10-fold increase in residential power consumption in 20 years. Commercial power loads will double in 10 years. An electrified industry means a massive increase to a rate of 667 billion kilowatthours in 10 years.

The most critical question facing you today

What is the best expansion pattern for your system? If the answer is right, you'll be able to determine capital investment more precisely than ever before, reaping great savings in planning, overhead, equipment and operation.

GHOUSE RCASTING*

LOADS OF THE FUTURE... BIG! In January, 1959, 426 top electric utility executives gathered at the Westinghouse Fourth Future Power Market Forum to preview electrical requirements for 5, 10, 20 years into the future. Read this message of the 4th Forum on the following pages.



Loads are growing fast

Spectacular growth in utility loads in the 1960's and 1970's is certain. Exploding population means 32 million more people to serve by 1969. Over one and a quarter trillion kilowatthours is the projected power market. To produce energy on this scale will require a generating capacity of 295 million kilowatts . . . more than twice today's capacity. How can this be achieved at an optimum return on invested capital?

Power systems are becoming more complex

A simple list of questions spells out the magnitude of expansion planning for any utility: When will new capacity be needed? What type of unit—coal, hydro, nuclear? What size—100, 200, 300 or even 800 mw? The heat rate? A new site? A developed site? And what about reliability? Transmission at 345 kv or 690 kv? Will distribution voltages double?

Today, each question is more complex than it was yesterday. Together, they present a formidable barrier to the success of conventional system planning methods. And tomorrow . . . in the era of the superload . . . power systems will grow and become even more complex. New long-range planning methods are not only desirable, but mandatory.

There is a way to plan your system for the next 20 years

Westinghouse has developed a basically new technique of total system planning. This method is Powercasting. Powercasting offers you a way to create a master plan for system expansion, together with total capital requirements, projected for the next 20 years.

Westinghouse Powercasting . . . a two-fold plan of action

1. Westinghouse Powercasting will predict your future system needs comprehensively and with scientific accuracy. This planning method is unique, because it takes into full account not only known and predictable factors, but unknown and chance considerations.

2. Based on a program of product development, Westinghouse will project and recommend future equipment investment, geared to the power demand predicted for your system, and keyed to your master plan of expansion.

Early and accurate prediction of future equipment needs will enable you to save substantially on purchases, because you will order the right equipment at the right time... eliminate premature or late buying. Greater flexibility in over-all planning means you can enter money markets for needed capital at the most advantageous times.

Powercasting is at work now

A complete system study is currently under way with Public Service Electric and Gas Company. A mathematical model of the system has been built, and a new plan of expansion is now being evaluated. Powercasting makes it possible to consider simultaneously more of the factors which influence system expansion.

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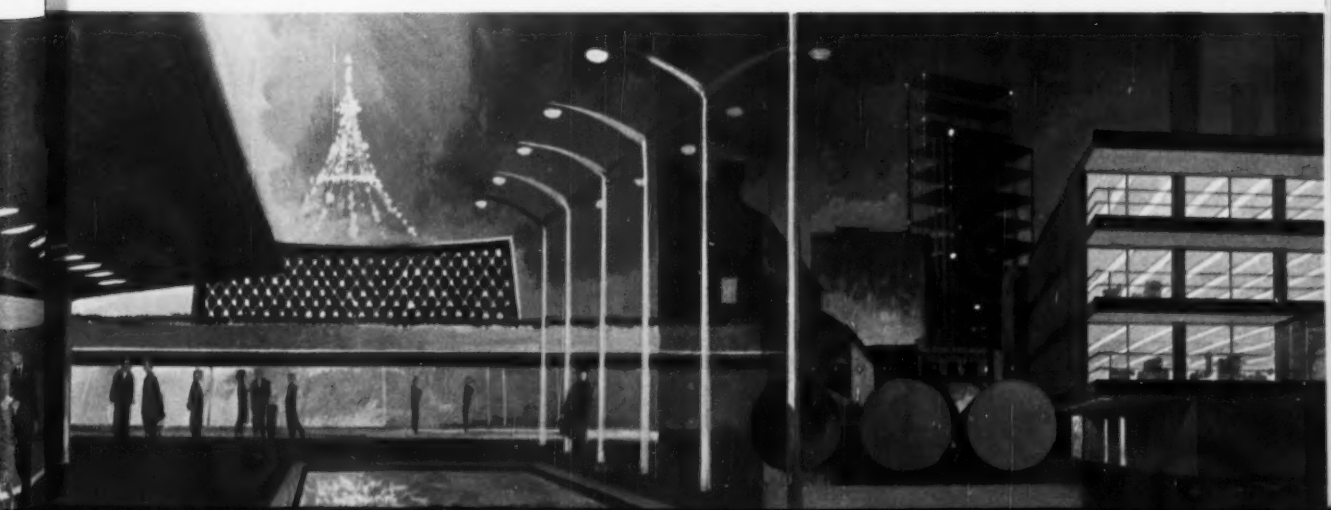
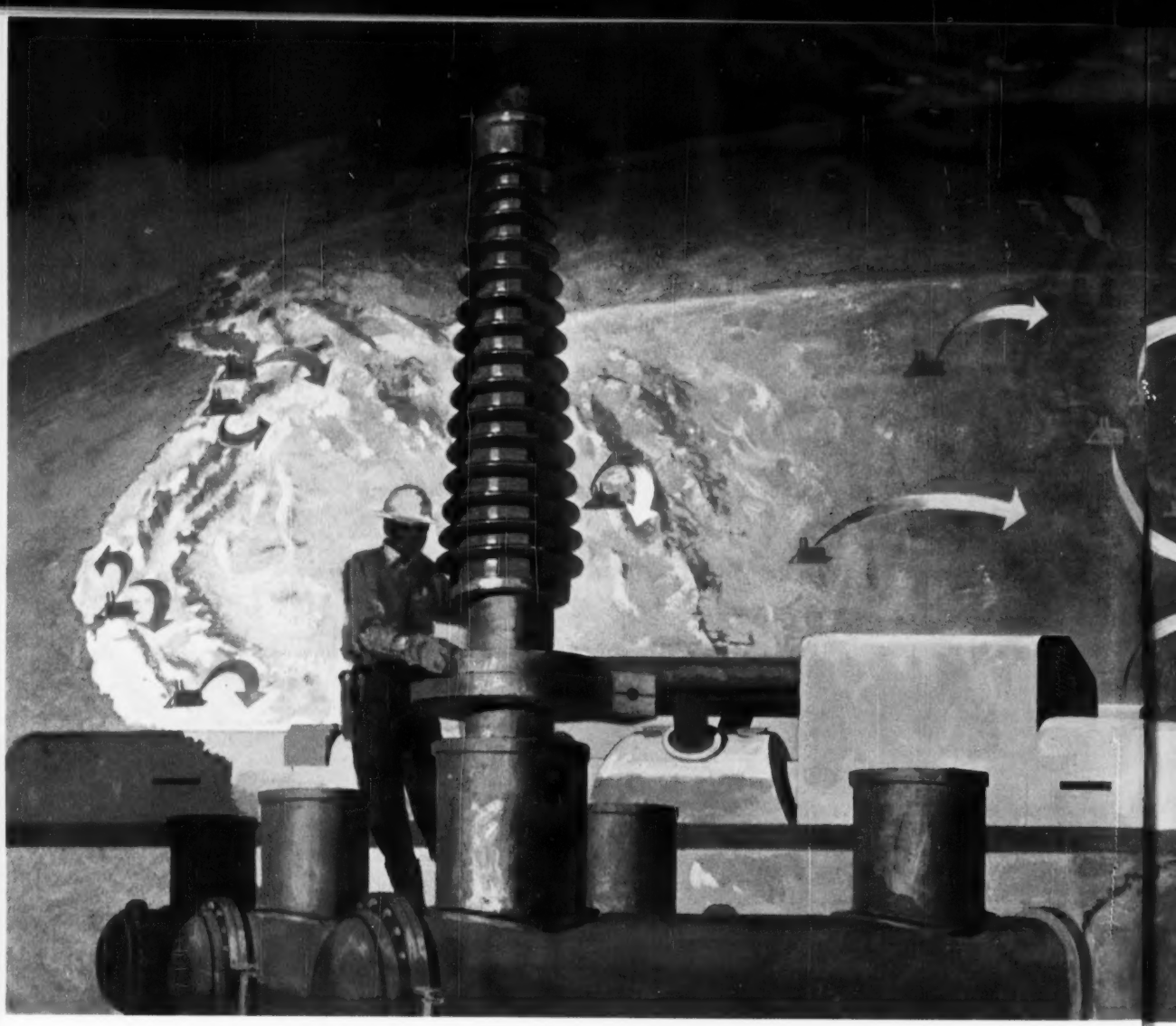
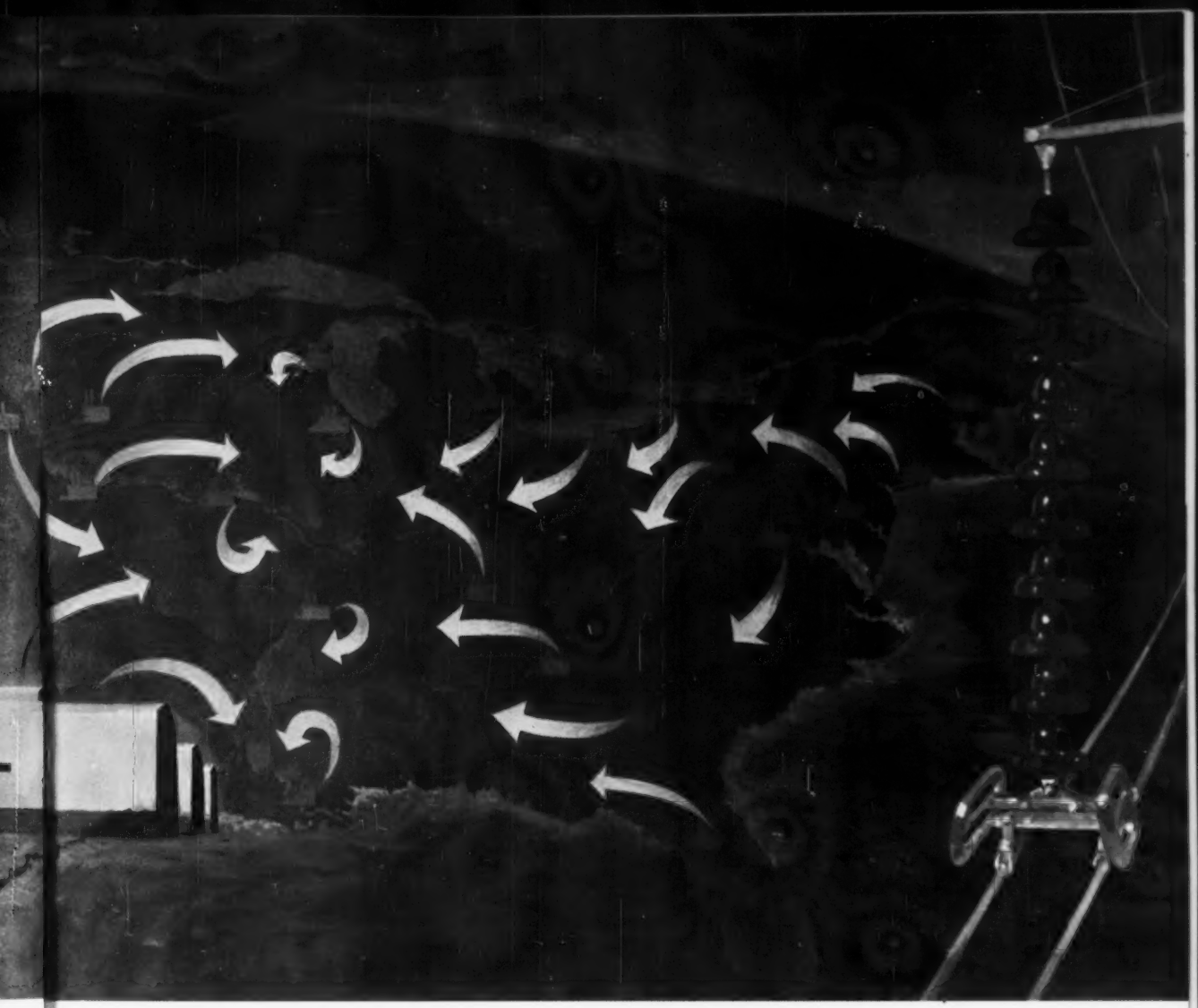




WESTINGHOUSE POWERCASTING

can help you plan your system expansion economically...and now



Over the next 20 years, the electric utility industry will make a system investment of approximately 150 billion dollars. The resulting capacity would be enough to serve the entire world today . . . perhaps even two worlds. Growth on such a scale demands planning of a quality never before achieved . . . to realize investment and operating economies, to improve reliability, to increase customer acceptance.

. . . to produce larger blocks of power—300, 400, 800 mw

Tomorrow's supersystem implies generation of larger increments of power, even now an inescapable policy for many utilities. Larger, more reliable turbine-generators put into service will require stiffer internal ties for emergency conditions.

. . . to transmit at higher voltages—690 kv and beyond

Moving future bulk power from station to load center will be impossible at today's transmission voltages. In many areas, limited rights of way have already dictated higher voltages. On large systems, extra-high voltages will be the only answer in serving congested areas. Single circuits will carry the millions of kilowatts that half a dozen lines transmit today. The economies of EHV are becoming increasingly apparent; as the voltage goes up, the cost of kilowatt capacity comes down. Transmission lines of the future will be rated above 230 kv . . . at 345 kv . . . to 690kv, and most certainly beyond.

. . . to interconnect with neighboring systems

Peak load demands loom large as a problem in the fast-coming era of the superload. However, there is a way of handling system peaks, and at the same time reducing your generating capacity . . . broad-scale system interconnection. Interconnection will allow power distribution that follows the sun, and a sharing of capacity with neighboring systems. This method of operation will entail exchange of thousands of kilowatts, all at extra-high voltages.

. . . to distribute at doubled voltages

To distribute big loads economically, major system modernization is a must. Higher voltage is one measure that can bring you substantial operating and investment economies.

These are major trends evident today that will be typical of systems of tomorrow. To bring these systems into being demands the closest kind of coordination between system engineering and equipment design and application. The one method available to you today to do this job . . . to do it thoroughly and with scientific accuracy . . . is Westinghouse Powercasting. A description of Powercasting in action follows.

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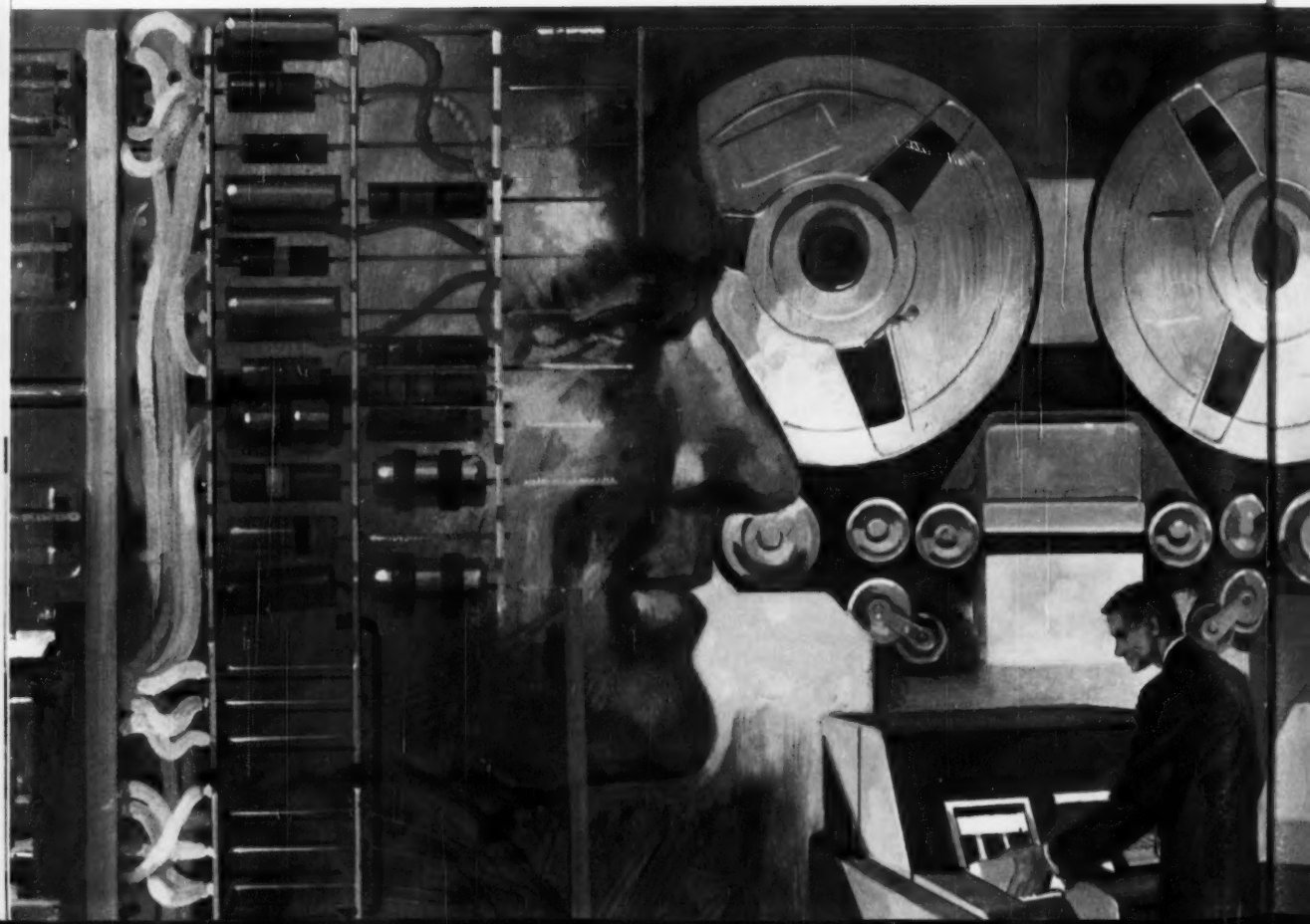
WESTINGHOUSE POWERCASTING*

. . . can help management anticipate the problems, make the right decisions



The superload and the supersystem mean an era of increasing capital investment, accompanied by increasing carrying charges and production costs.

It is increasingly apparent that cost-reducing product improvements and technological advances are no longer sufficient to meet the onslaught of inflation. Drastically new equipment application ideas are indicated. Fundamental changes in system planning methods are the only way out of the revenue-profit squeeze.

Costly errors in planning can be avoided

The decisions you make today are those you will have to live with for years to come. Moreover, each commitment sets up a chain reaction to exert widespread areas of influence on the whole future of a utility company. Errors in planning can be costly and practically irremediable.

Westinghouse can now offer the electric utility industry a new system expansion planning method . . . Powercasting. This method is both timely and comprehensive. Timely, because it has been created with the future character of the industry in mind—the 1960's and beyond. Comprehensive, because it takes into account not only present standards and known factors, but chance and unknown factors such as forecast error and forced outage.

Powercasting: first, a planning method—system simulation

Simulation—or Operational Gaming—involves a complete mathematical model of a utility's system and of adjoining interconnected systems. The model duplicates an actual utility system—responds to the same factors, produces the same results as the actual system. To operate this model system, a staggering array of variables, both predictable and unpredictable, have been taken into account. In the latter category, use is made of the newest mathematical techniques of gaming—Monte Carlo, autoregressive series, Markov chains, and other methods.

20 years' system experience in 20 minutes

In 20 minutes, a high speed digital computer can reproduce 20 years of system experience on a mathematical model. Day by day, the model determines what units must be run to supply the load; it starts up these units, accepts forced outages, maintains the units, computes risk of losing loads, adds generating units and interconnections, builds transmission facilities as required. The model uses the same logic to make decisions as do system planners and operators, deliberately makes the same mistakes as the operators do. Distributions and random variations used are based on the past behavior of actual systems. Human decisions are balanced against these random events.

At the end of the 20-year experience, the computer records all decisions made—dates when additions should be made, present worth of all expenditures, total capital needs, production and operating costs.

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WESTINGHOUSE POWERCASTING*

...already at work for Public Service Electric and Gas

Project keyed to sound financial plan and projected service standards

What is the best plan to expand system generation and transmission in meeting growing loads? This is the question Public Service Electric and Gas Company asked Westinghouse to help answer in a new and better way. The unprecedented joint study which has resulted is well on the way to an answer to this question.

It was obvious at the outset that this study was so broad and complex that groups of specialized talents, working simultaneously on all phases of the project, were essential in undertaking the problem. Seven groups of engineers, composed of personnel from both the Westinghouse Electric Utility Engineering Department and Public Service, formed a coordinated team. These groups have studied these areas: load forecasts, unit requirements, risk of shortage, transmission plans, production costs, capital costs, present worth economics. The results of these investigations were integrated into a single plan for evaluating alternate expansion patterns.

Progress report . . . a mathematical model has been built

From the system model "built" for Public Service, a plan of expansion is being evolved and evaluated. Flow charts have been laid out that describe a system planner's thought processes as he lays out new high-voltage transmission. Other charts trace the system operator's thinking as he plans maintenance schedules. Still others relate Public Service's experiences with those of the Pennsylvania-New Jersey-Maryland Interconnection. Past generator outage records are yielding new information through new methods of analysis. Customer service standards, together with frequency and duration of service loss, in terms of generating capacity additions, are being reappraised.

. . . through Powercasting, a master plan of expansion is emerging

This is but a fraction of the areas in which results are anticipated. A master plan is being evolved considering these and other questions:

1. How much are further improvements in heat rate worth?
2. When will nuclear plants become competitive with fossil fuel on a specific system?
3. When is the retirement of old turbines justified?
4. How much can a utility spend for reliability?
5. Should a utility install gas turbine, pumped storage or steam peaking units?
6. What is the optimum spinning-reserve policy?
7. How will larger and larger units affect the reserve requirements of a system?
8. What is the effect of annual costs of possible future developments on the cost of the initial step in an expansion pattern?

Two factors will make this Public Service plan one of the century's most significant developments in the electric utility industry. First, the pattern of expansion itself will be far more accurate than any long-range pattern planned by conventional methods. Secondly, many more of the complex technical, financial, and human factors involved in the utilities' future expansion problems can be included in the study.

Powercasting is available to you now, because for years Westinghouse has plowed earnings into research to insure the future of the electric utility industry.

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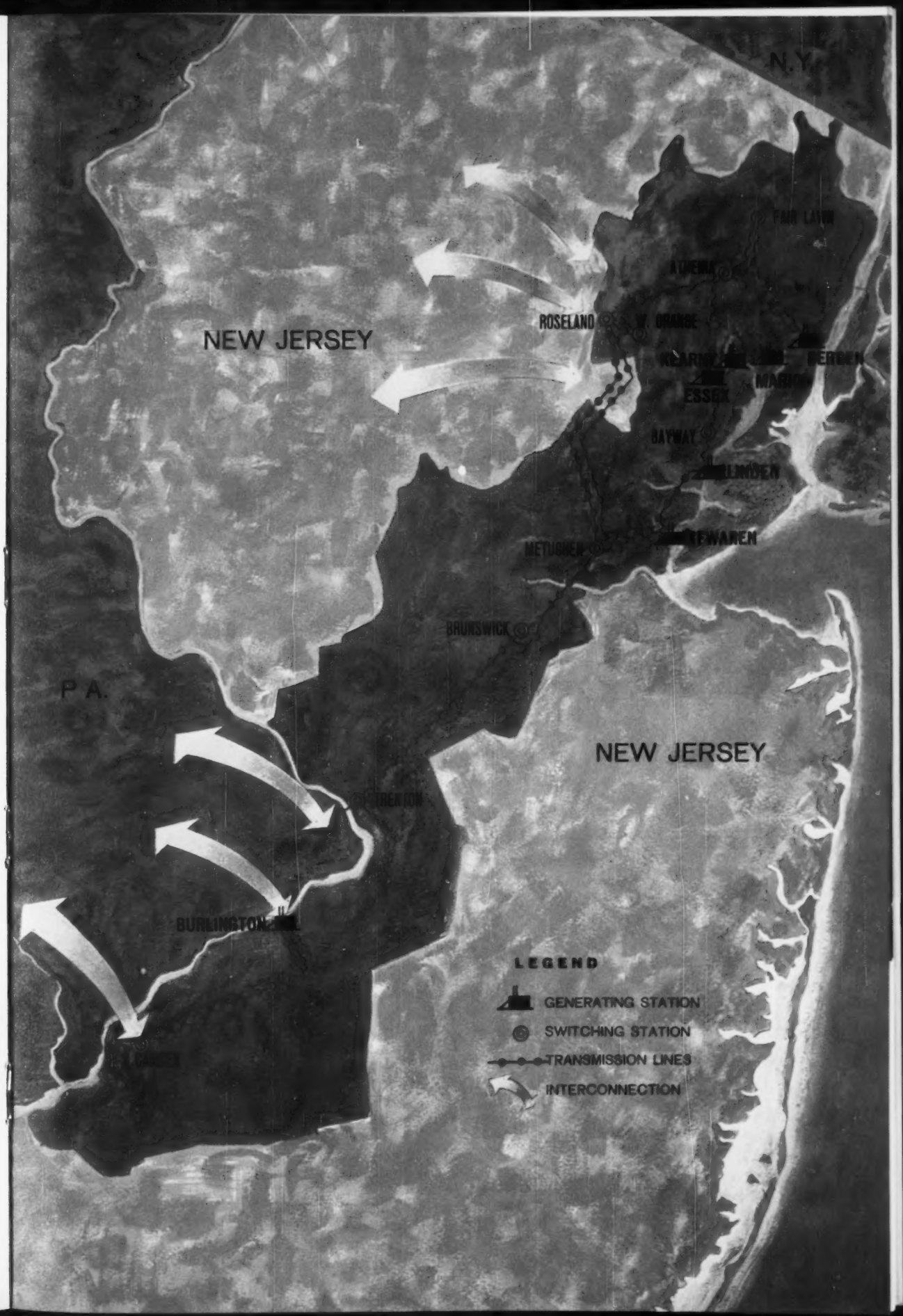
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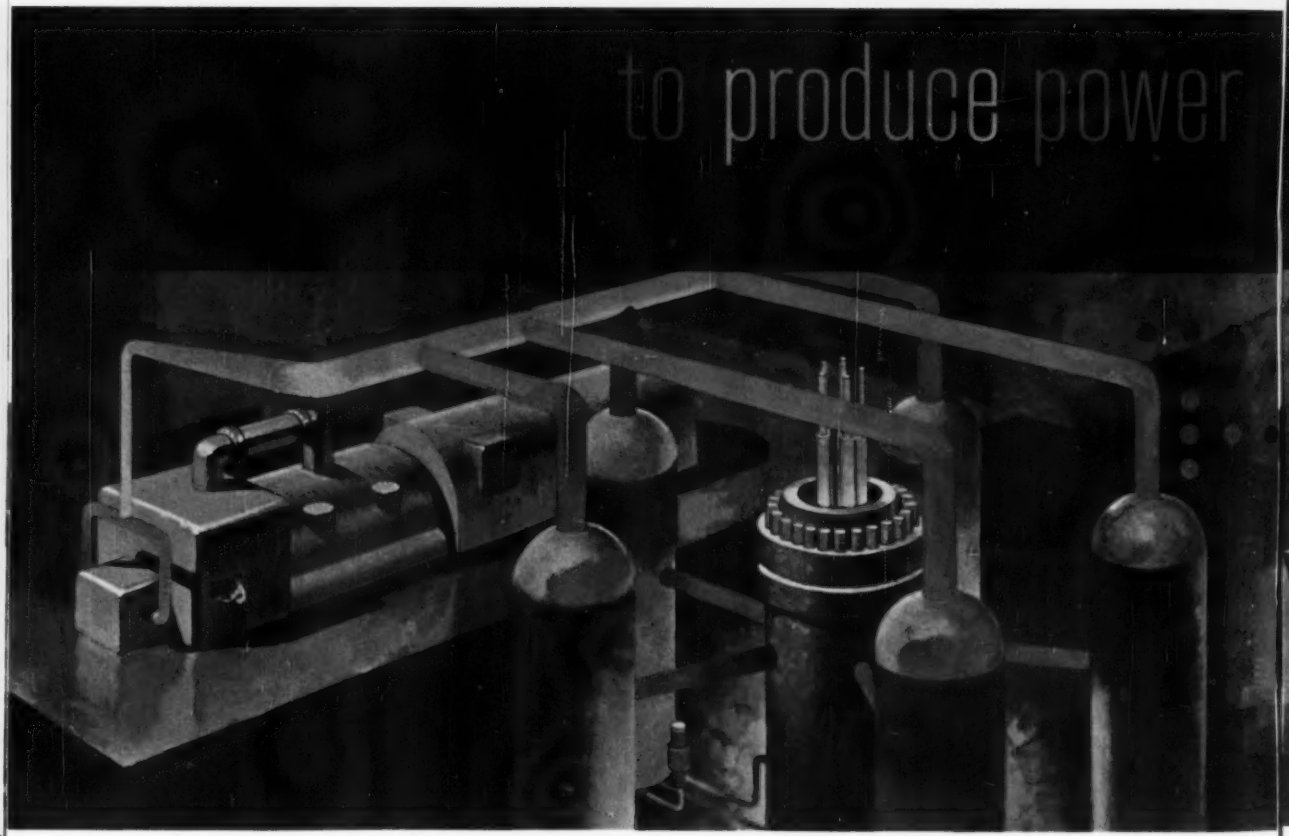
is ready today to build products to produce power



Westinghouse is now ready to build a 330,000-kw nuclear power plant

Westinghouse offers this nuclear generating station for service on your system in 1965. This plant will compare in capacity with the largest fossil fuel plants required to meet present standards of economical generation. Power cost? Competitive with fossil-fueled plants in some areas of the country today.

Through comprehensive evaluation of dozens of possible reactor designs, Westinghouse has concluded that no one nuclear power plant is ideal for all times, or every utility power need. The most promising reactor types are currently under intensive development. For generating stations of the size now being added to utility systems, the pressurized water reactor is the only nuclear plant sufficiently advanced and proved to be offered for immediate construction.

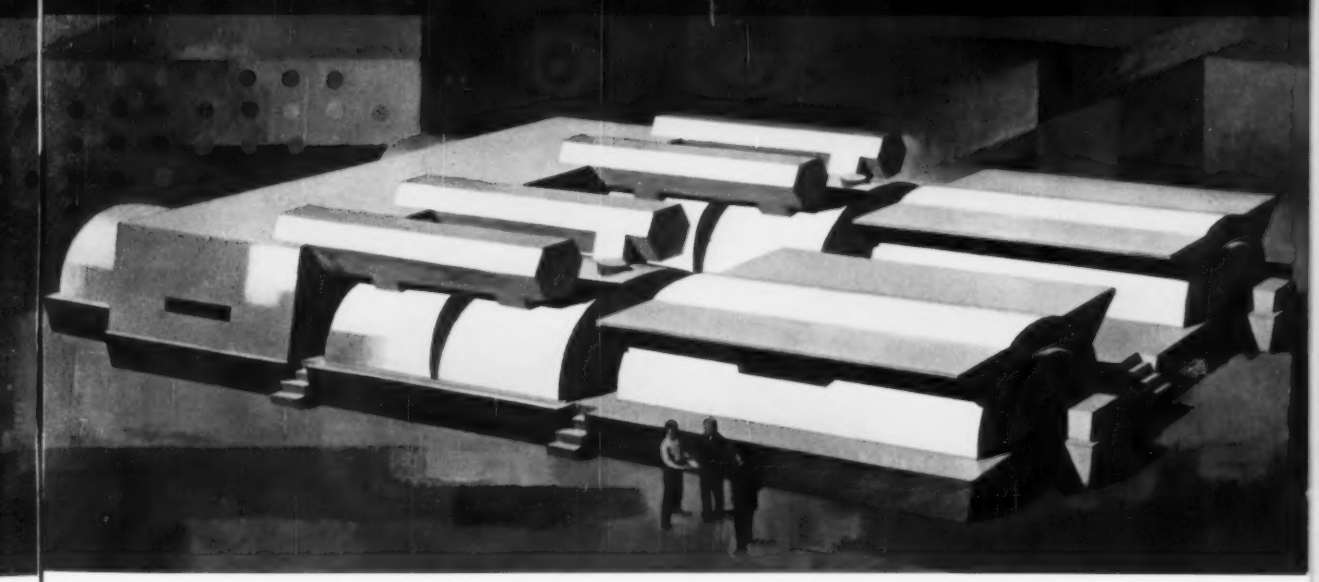
This plant is a result of the $40 million nuclear power investment by Westinghouse to make world-wide power generation from the atom practical, thoroughly economical.

Westinghouse is ready to build unprecedented 800,000-kw turbine-generator now . . . almost twice the capacity of the world's largest today

From Westinghouse research has come a new 28-in. exhaust end blade capable of 25 percent more power than any that have preceded it. Cross-compounding with four exhausts on each of two 3600-rpm shafts, this blade makes possible an 800,000-kw turbine-generator unit. Here is tomorrow's turbine-generator to supply massive amounts of low-cost, dependable

for your future system

Experience to understand total system operation . . . For decades, a special staff of engineers at the Westinghouse Electric Utility Engineering Department has been applying a bold mixture of technical knowledge and imaginative thinking to broad system problems. From long-range studies, basic concepts of power systems of tomorrow are being created. This capability can be put to work for you as . . . POWERCASTING.



electric power to a growing American economy.

Another turbine-generator of tomorrow has already been produced by Westinghouse. The highest pressure, highest temperature turbine ever undertaken is the 1200° F, 5000-psi unit for the Eddystone Plant of the Philadelphia Electric Company. Because temperatures in this range are beyond the capability of ferritic materials, this turbine uses austenitic alloys. Over-all station heat rate will be about 8100 Btu per kwhr—the most efficient in the world. This machine will produce 10 percent more power from the same amount of fuel than any now in operation.

Efforts to wring more and more power out of a pound of coal do not end with these giants. A combined gas-steam plant is coming. The same combustion source provides steam for the steam turbine and heat for the gas turbine. Result? Higher thermal efficiency.

With two outstanding breakthroughs, Thermalastic* insulation and Inner Cooling, Westinghouse generators have kept—even exceeded—the pace of power generation needs. A 384,000-kva generator is being built; even higher ratings are in the offing. Generators can be built now to match any turbine that can be built, any system plan that can be devised.

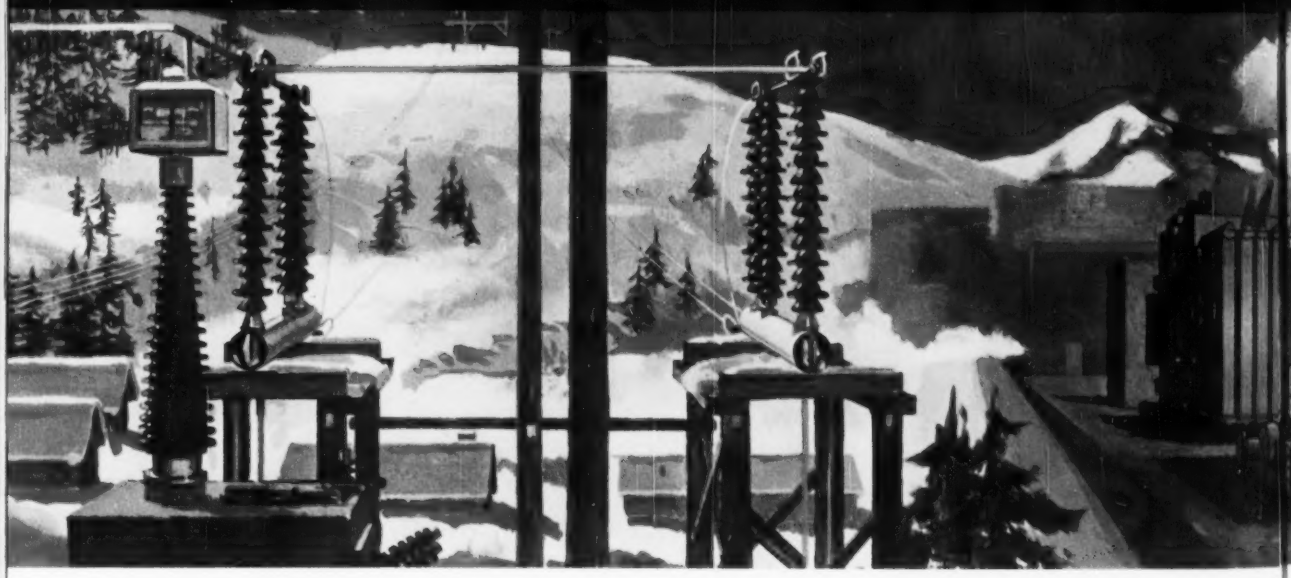
This generating equipment can be built now, because for years Westinghouse has plowed earnings into research to insure the future of the electric utility industry.

*A Service-Mark of Westinghouse

YOU CAN BE SURE...IF IT'S **Westinghouse**

WESTINGHOUSE POWERCASTING*

is ready today to build products to transmit power



Westinghouse is ready now to build power transformers for 690-kv systems

The great hinge on which the design of transformers of the future swings is extra-high voltage. The Tidd project of the American Electric Power Company, begun 13 years ago, proved that EHV transmission at 345 kv, 460 kv and above was practical and dependable. All operating conditions that could be expected were simulated. Today, transformers, power breakers, arresters and disconnect switches operate at extra-high voltages successfully on hundreds of miles of utility system circuits.

Three years ago, a laboratory of rocks and snow, the Rockies, began yielding a wealth of data for design and operation under extremes of weather and high altitudes, furthering EHV studies. Sponsored by the Public Service Company of Colorado at Leadville, Colorado, this broad investigation of corona and radio influence, switching surges, conductor sizes, reduced insulation levels and economics of EHV is continuing.

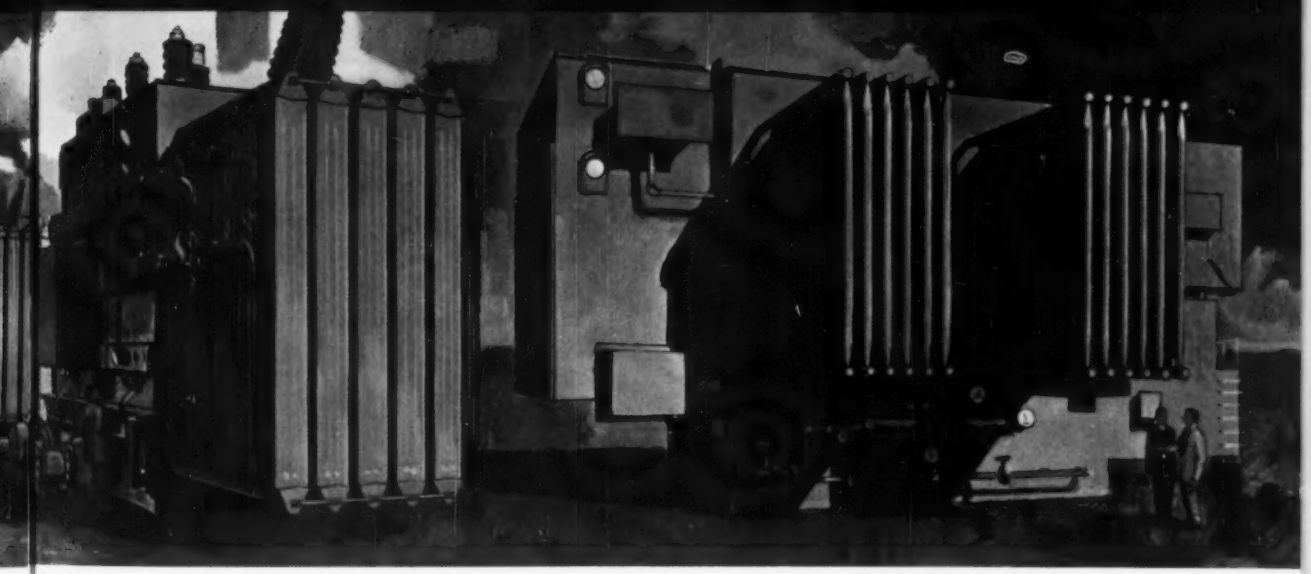
The Tidd and Leadville projects and other studies are the building blocks of EHV knowledge, making possible the design and application of the transmission equipment in your future.

Inner-Cooled transformers . . . reduced size and weight

Inner Cooling makes maximum use of oil as coolant and cellulose material as insulation, drastically reducing core and coil size. The significance of this design lies in two major areas. First, Inner Cooling now enables Westinghouse to build and ship transformers of enormous capacity. The world's first transformer

for your future system

Determination and resourcefulness to design the industry's most advanced line of apparatus . . . New Westinghouse products answer problems and objectives confronting the electric utility industry. At 200 research and design centers across Westinghouse, the industry's most concerted and interrelated effort to meet these objectives is continuing. This capability can be put to work for you as . . . POWERCASTING.



with Inner-Cooled construction was recently installed at New York State Electric & Gas Company, weighing only 3.1 pounds per kva. On higher voltage designs, weight has been brought down to 1 pound per kva.

Second, operating cost per kva is now lower than ever before. Performance has improved, permitting reduction of impedances and losses.

These compelling reasons commend the Inner-Cooled Westinghouse design for the transformer of the future.

Vapor-cooled transformers . . . combine dry-type safety with liquid-filled capacity and insulation level

Vapor-cooled, vapor/gas-insulated transformers are another major breakthrough in Westinghouse power transformer design. This technique uses fluorocarbons to transfer heat . . . as a vaporizable liquid for cooling and as a high-dielectric gas to insure proper insulation strength. Two such transformers—the world's first, at Baltimore Gas & Electric Company and Consolidated Edison Company—are now in service and promise to be the ultimate answer in congested areas. They're nontoxic, nonexplosive, fireproof, thermally stable; in brief—they are safer.

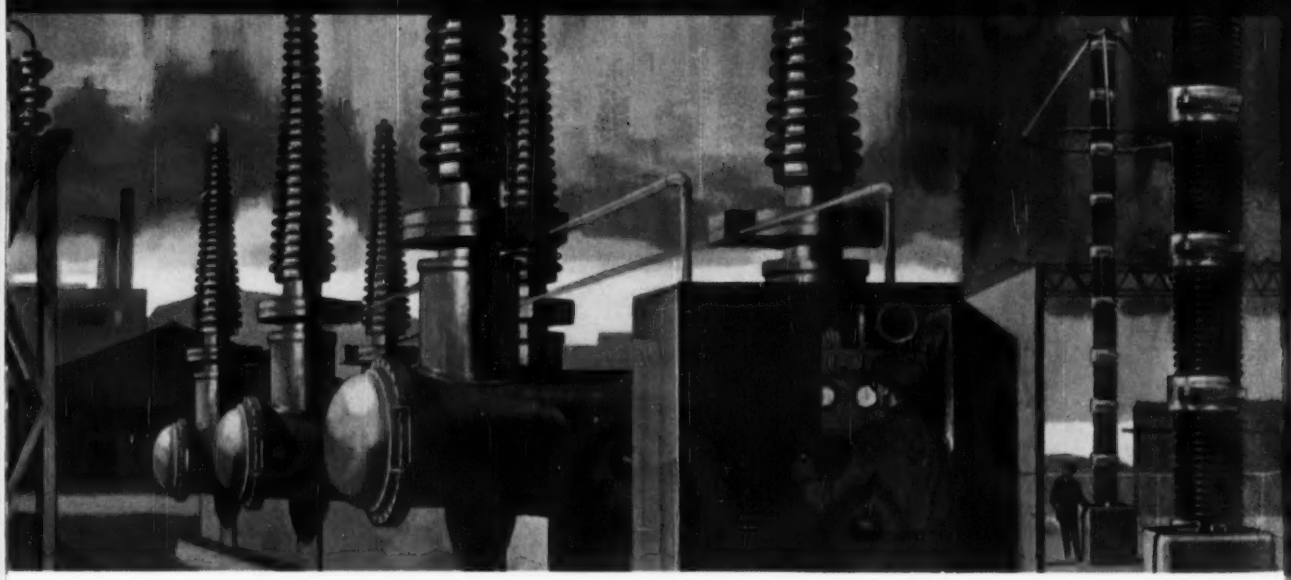
This transmission equipment can be built now, because for years Westinghouse has plowed earnings into research to insure the future of the electric utility industry.

*A Service-Mark of Westinghouse

YOU CAN BE SURE...IF IT'S Westinghouse

WESTINGHOUSE POWERCASTING*

is ready today to build products to distribute power



Westinghouse is ready now to build 690-kv power breakers . . . SF_6 Gas is breakthrough to conquest of the industry's costliest arc extinguishing problems

Sulfur Hexafluoride—SF_6 Gas—is the interrupting medium for a 230-kv, 15 million-kva power circuit breaker now being built for Pennsylvania Power and Light Company. What are the limits to capacity of the SF_6 breaker principles? There are none.

Capacity is only one measure of the most significant breaker design advance in over 15 years. Safety? SF_6 is inert, nontoxic, odorless, nonflammable; breaker is dead tank construction. Maintenance? Drastically cut; arcs are extinguished without gas deterioration. Weight? Reduced up to 65 percent over comparable oil breaker ratings; foundations can be simplified. Quiet? Comparable to oil breakers; ideally suited for those substations in high load density residential areas.

Here is one more example of how Westinghouse has spent millions in product designs to save utilities tens of millions in future construction and operation.

Westinghouse is ready now to build lightning arresters at and above 690 kv

The idea of a nationwide transmission grid highlights two needs immediately . . . extra-high voltage transmission and standards of reliability never before achieved. EHV will be required to move large blocks of power economically. But, a basic problem in EHV reliability has been lightning outage. Application of a completely new theory of lightning stroke now promises to reduce lightning flashover by three to one. Effects of lightning on different designs of transmission line can now be predicted with far greater

for your future system

Capability to produce the industry's most complete line of reliable apparatus . . . With utility industry progress at a dead run, a responsible manufacturer can do nothing less than provide equipment as operationally perfect as manufacturing science can produce. Westinghouse ability to continue to meet this challenge is evidenced by facilities being built and modernized throughout the company at the rate of 70 million dollars a year. This capability can be put to work for you as . . . POWERCASTING.

accuracy. Increased line reliability must be matched by improved protection of equipment. Westinghouse is ready now to build arresters to meet the obligation of reliable, economical transmission . . . to 690 kv.

You can reduce distribution investment 25% by doubling secondary voltages

Apparatus investment in distribution systems is well over a billion dollars annually. An opportunity to save hundreds of millions of such an amount can scarcely be overlooked.

For example, in a high-use residential area, a 37½-kva transformer may serve four homes. In new housing developments, by changing over to 240/480-volt service, one transformer can do the work of four or five. With higher secondary voltages, primary voltages may be raised to 25 kv or even higher. This eliminates present intermediate voltage levels and need for substation transformation.

Average industry installation costs and capitalization rates indicate higher secondary voltage systems will save substantially through the years over present conventional systems.

Westinghouse is ready now to build pole-type transformers at 333 kva for commercial loads.

This equipment of the future can be built now, because for years Westinghouse has plowed earnings into research to insure the future of the electric utility industry.

*A Service-Mark of Westinghouse

YOU CAN BE SURE...IF IT'S Westinghouse

Powercasting is intended to increase the cooperation, coordination and total effectiveness of utility companies, their consulting engineers and Westinghouse in long-range planning. Westinghouse intends through Powercasting to reduce utilities' total expenditures for overhead, planning and equipment over a time span of at least 20 years.

here's how WESTINGHOUSE POWERCASTING* can be put to work for you

WESTINGHOUSE WILL . . .

. . . Send a qualified Powercasting Team to your office.

. . . Help you outline problems and objectives for your particular system.

. . . Arrange a special seminar to detail the project specifications.

. . . Build a mathematical model of your complete system.

. . . Predict your future system needs comprehensively, accurately.

. . . Program your equipment investment and gear it to the power demands of your system.

Only Westinghouse offers this Powercasting Service, a continuous plan of action for stable growth in the electric utility industry.

*A Service-Mark of Westinghouse CP-1054

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS CBS TV FRIDAYS

Procurement & Products

(For further information refer to Readers Service on page 100)

Transformers . . .

. . . in pad-mounted, single-phase units have high and low-voltage compartments at opposite ends of the unit. The transformers, designed for residential underground systems, require no additional housings or fence. Available in ratings of 25, 37½, 50, 75 and 100 kva, the units are mounted entirely above the surface of a level concrete pad. Primary voltages of 12,470Y, 13,200Y and 13,800Y are furnished. Secondaries are 120/240 v.

General Electric Co, Schenectady 5, N. Y.

Derrick . . .

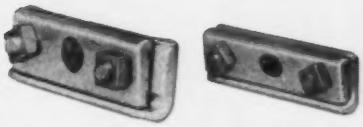
. . . features simplified design to lower costs without sacrificing quality. Boot strap linkage makes it possible to power the Series 11000

Derrick with one hydraulic cylinder. Built to handle 60-ft poles, the three-legged derrick has a maximum head height of 25 ft and lowers to within two feet of the ground.

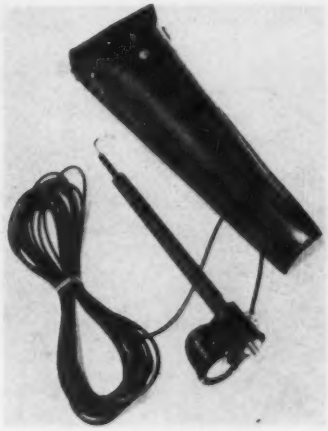
Holan Corp, 4100 W 150th St, Cleveland 35, Ohio.

Cable Clamps . . .

. . . for aerial cable provide generously belled grooves for maximum protection to cable messengers. Two types are listed. Both are supplied with ½-in. diameter track bolts and are designed for mounting with a machine or double arming bolt, which also serves as a third clamping bolt.



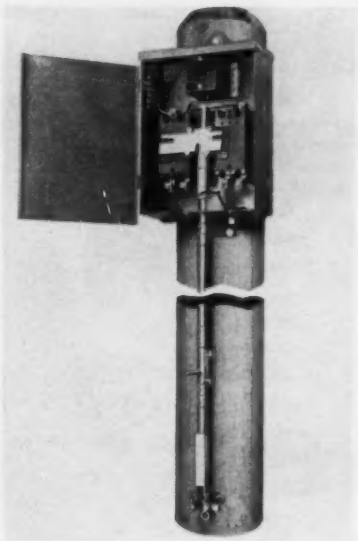
Malleable Iron Fittings Co, Pole Hardware Div, Branford, Conn.



High Line Voltmeter . . .

. . . reads up to 15 kv. The High Line Safety Voltmeter, Catalog No. 81682, attaches to any standard hot stick with a tapped head. The instrument has two scales of 0-5 kv and 0-15 kv which are easily read at a distance of 8 ft.

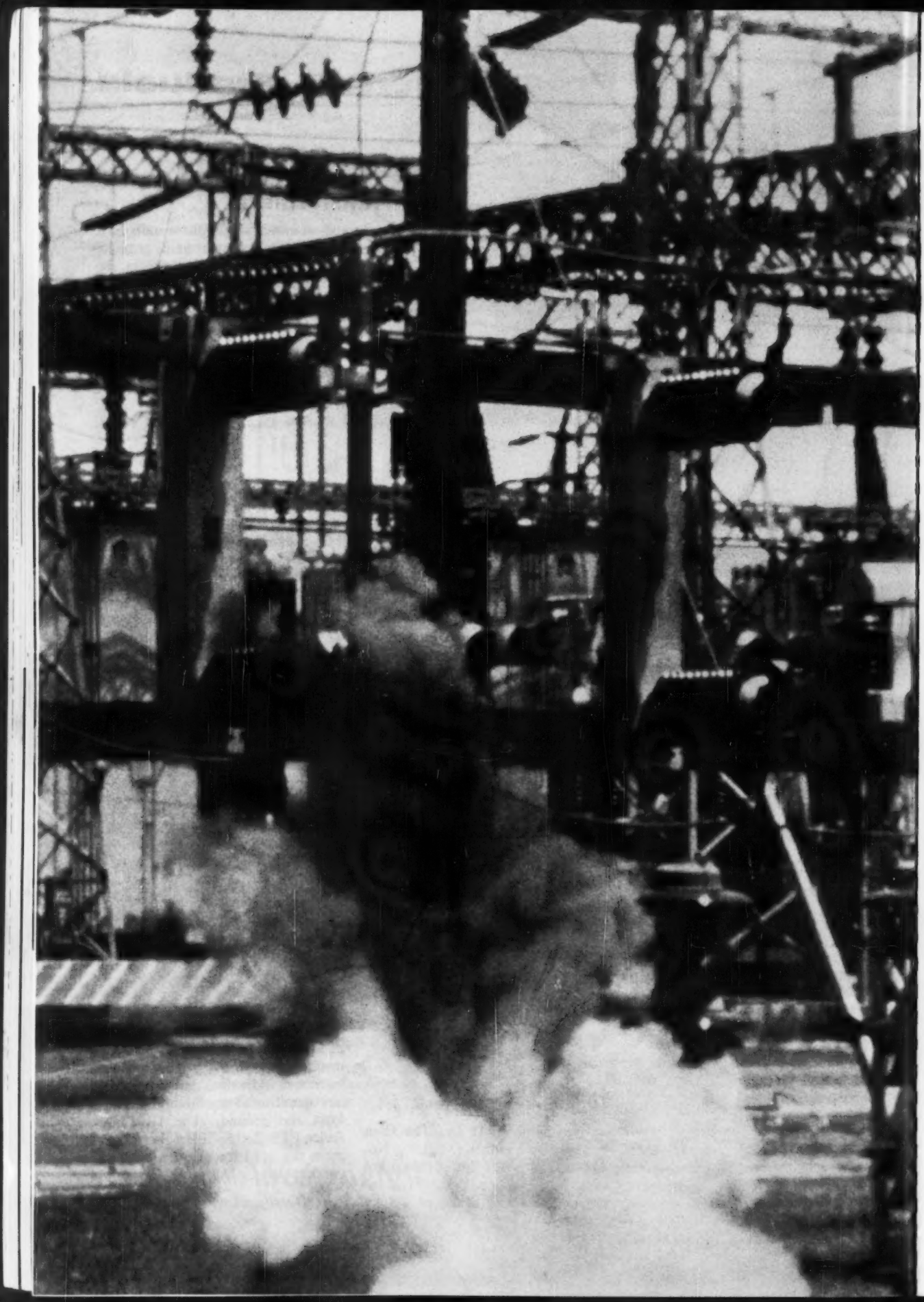
Western Electro-Mechanical Co, Inc, 300 Broadway, Oakland 7, Cal.



Split Breaker . . .

. . . provides advantages of pole-top metering plus two-way split entrance with both individual and simultaneous operation of two circuit breakers from the ground. The Hi Liner Series PTB-220 Split Breaker eliminates the need for meter loops and conduit runs. Designed for rural

(*Continued on page* 100)



Here is a 1,900,000 kva test shot on an S&C power fuse

...But what does it prove?

Absolutely nothing . . . without complete instrumentation and test data

TEST DATA

Data on Test Circuit	
* Normal frequency, cycles/second	60
Bus voltage, phase-to-phase, volts, rms	38,100
Bus voltage, phase-to-ground, volts, rms	22,000
* Power Factor	Less than 12%
Available Fault, computed	
Kva, three-phase, symmetrical	1,900,000
Amperes, rms, asymmetrical	46,500
Amperes, rms, symmetrical	29,200
Data Taken During Line-to-Ground Test	
From Magnetic Oscillograms	
* Normal frequency, cycles/second	60
Bus voltage (normal frequency), volts, rms	38,100
* Recovery voltage across fuse (normal frequency), volts, rms	22,000
* Current through fuse, amperes, rms asymmetrical	42,300
Arcing time, cycles	0.8
* Total clearing time, cycles	0.8
Arc energy, watt-sec.	383,000
Arc power, peak, watts	110,000,000
From Cathode Ray Oscillograms	
Natural frequency, cycles/second	19,000
Recovery voltage, across fuse	
(Normal frequency) volts, peak	31,000
(Natural frequency) volts, peak	32,000
Rate of rise, volts per μsec ($4E_{s\text{-}p}$ f x 10^{-6})	2,430

*Required by AIEE and NEMA testing standards

—such as the quantitative record (shown at left) of this short circuit test shot.

without skillful analysis

Even when the fuse clears, the test data have to be critically examined. For example, could this apparently successful test shot have been just a lucky—or easy—break? Was the natural frequency of the circuit unrealistically low? Was the rate of rise and/or the amplitude of recovery voltage across the fuse high enough? Does the arc energy developed suggest marginal operation? These questions are tough to answer for anyone but a fuse expert. They aren't covered in NEMA or AIEE short circuit test standards.

without multiple shots

For a given test condition, numerous shots must be made to factor the variables of fuse ampere rating, manufacturing tolerances, and minor differences in construction.

without a vast testing complex

One test (let alone one *shot*) is no basis for proving out a fuse. It has to be integrated with other tests amassed over the years in the field and in the laboratory, in order to substantiate the published interrupting ratings at all voltages, for all circuit parameters, at all fault levels.

This kind of electrical testing is essential for the performance integrity of a high voltage power fuse. Expensive, yes! But you'll find it anyway behind S&C's type SMD Power Fuse. You won't find it behind the bargain varieties which use ballistics as a substitute for electrical testing.

The reproduction from test film (left) and the test record (above) cover one of 19 shots on one type of SMD Power Fuse on one voltage rating (34.5 kv), at two high fault levels on just one day of testing.

Oh, by the way, all that the 19 shots proved was that the SMD is satisfactory for very high (and tough) phase-to-ground faults on a 34.5 kv system. That's all S&C got from a single day's testing! It's simply a small part of the 20-year testing complex which backs up the SMD's ratings.

S&C ELECTRIC COMPANY
4421 Ravenswood Avenue, Chicago 40, Ill.

S&C

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

GE ..... Transformers ☐
Holan ..... Derrick ☐
Malleable Iron ..... Clamps ☐
Western Electro-Mechanical ..... Voltmeter ☐
Hi Products ..... Breaker ☐
Line Material ..... Transformers ☐
Pacific Mercury ..... Standard ☐
Chance ..... Tool ☐
United Sensor ..... Slip Ring ☐

OTHER

Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

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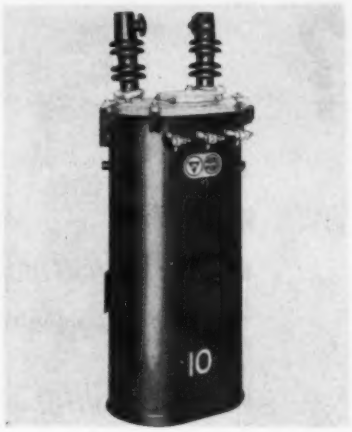
FOR:
Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

NOVEMBER 9, 1959

Split Breaker . . .

(Continued from page 97)

loads, the unit is available in eight breaker sizes from 15 through 100 amp, in pairs or in any combination of ratings.
Hi Products, Inc, 7700 Wentworth Ave South, Minneapolis 23, Minn.



Transformers . . .

. . . are plastic coated to eliminate outages caused by wildlife contacting terminals. The Levroc coating, which has a dielectric strength of about 800 v per mil of thickness, also provides corrosion resistance for outdoor durability. All surfaces receive a coating with a minimum thickness of 20 mils.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Street Standard . . .

. . . is designed for use with the company's new flasher warning lights. The Model 50-6053 has a heavy cast-steel base and comes complete with "Go Slow" sign. To prevent thefts, warning lights can be locked on the stand with mounting lock.
Pacific Mercury Co, 14052 Burbank Blvd, Van Nuys, Cal.

Compression Tool . . .

. . . for service taps and service-entrance connections is CO_2-powered. Jaws of the tool are activated by a lever tripped with the thumb of the

tool-holding hand. Thus the operator has one hand free to position the conductor and compression sleeve. Power is furnished by CO_2 gas stored in liquid form in a cylinder that screws into the handle of the tool. Over 50 crimps can be made with a cylinder.
A. B. Chance Co, Centralia, Mo.

Slip Ring . . .

. . . is designed for strain gage measurements on rotating shafts up to velocities of 20,000 rpm. Electrical contact between rotating and stationary parts is through a film of mercury, which results in zero noise level and long life.
United Sensor & Control Corp, Box 127, Glastonbury, Conn.

More New Products

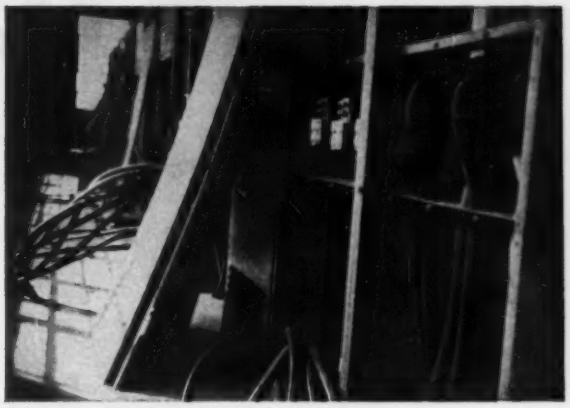
Ultrasonic cleaning unit for small part cleaning applications features 1-gal 9¼ x5x6-in. tank. The Model 100 delivers average power output of 60 w.—National Ultrasonic Corp, 111 Montgomery Ave, Irvington, N. J.

Polyethylene **barrier rope** provides high visibility with strength. The $\frac{5}{16}$-in. diameter rope has two strands of yellow, one of black, and tests about 1,500 lb.—Albert W. Pendergast Safety Equipment Co, Tulip and Longshore Sts, Philadelphia 35, Pa.

Lubricant is formulated for use at high temperature. Known as "dag" 207, it is a concentrated dispersion of colloidal molybdenum disulfide in an LB series "Ucon" lubricant.—Acheson Colloids Co, Port Huron Mich.

Installed in underground ducts, Paranite Super Pararite-Paraprene® network cable services a modern electronic computor installation.

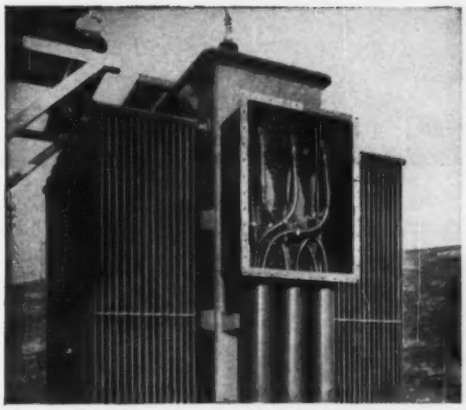
Paranite Super Pararite-Parasyn cables carry primary power between transformers and switchgear control panels in an ore reduction plant.



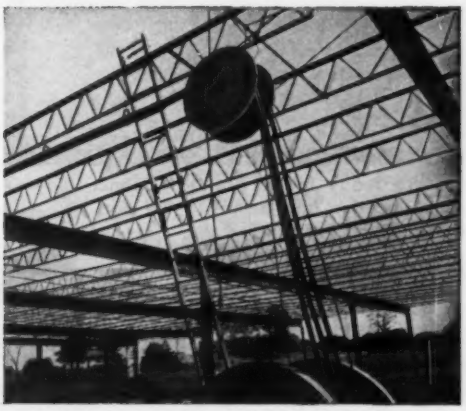
Across the nation for trouble-free installations...

PARANITE®

"IF IT'S PARANITE IT'S RIGHT"®



Paranite Super Pararite-Paraprene cable serves as the primary transformer feeder in a new municipal water pumping station.



Overhead duct installation of Paranite Super Pararite-Parasyn® (PVC) serves as a secondary feeder cable in a manufacturing plant.

The consistent selection and performance of Paranite cables from 600 volt network through 23,000 volt power cables mark them as products of close quality control. These Super Pararite-Paraprene and Super Pararite-Parasyn (PVC) cables illustrated above, indicate the versatility, national availability and proven trouble-free performance of Paranite installations.

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Fort Wayne, Indiana

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Birmingham, Ala.; Anaheim, Calif. • Sales Offices in All Principal Cities

RT&E Terra-Trau

Area developer, by previous agreement with the utility, does trenching and pouring of concrete at his expense. Utility and developer cooperate in establishing final grade, so that uniform cable depth can be maintained.

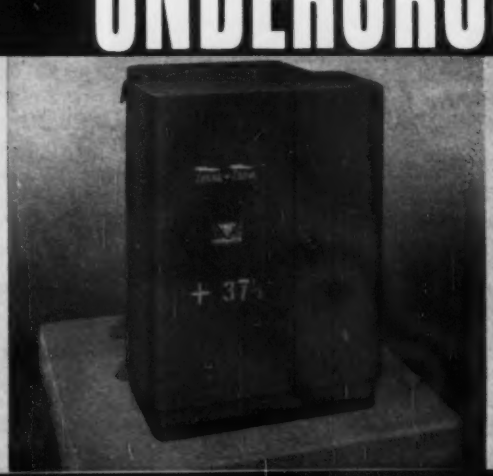
Conduit bends for primary cable are positioned at transformer site. After ducts for both primary and secondary cable are laid, the trench at pad location is back-filled, and loose earth is tamped.

SHOW HOW ONE LEADING U

When homes are ready for service, transformer is brought to pad location and bolted to the pad by means of the studs set in the concrete.

Stress relief cones are formed at primary cable terminations. Connections to transformer bushings are made by means of hot line clamps designed for either hand or hot stick operation.

UNDERGROUND DISTRIBUTION S



Terra-Trau ready for service. All that remains to be done is the connection of customer-owned secondary and final landscaping, to be completed as shown in this illustration.

INSTALLATION PHOTOGRAPHS

Wooden form for transformer pad is constructed at transformer site and concrete is poured. Both of these jobs are the responsibility of the area developer.

Direct burial primary and secondary cable is laid in trench and terminations brought out at transformer site.

UTILITY HOLDS DOWN

Lineman demonstrates method of removing or inserting bayonet-type high voltage fuse or disconnect switch that is used when energizing or de-energizing the Terra-Tran.

Secondary connections are made to complete the installation. Terra-Tran's green finish blends in with surroundings.

SYSTEM COSTS

RT&E

ENGINEERING TALENT CONCENTRATED ON ONE IDEA
A BETTER TRANSFORMER

CORPORATION
WAUKESHA, WISCONSIN
PORTLAND, OREGON

DD

PEABODY'S COAL RESERVES

could power New York City's television sets for 1,644 years

Yes, Peabody's Coal Reserves, if used to generate electricity, could power New York's television sets for 1,644 years. They are large enough to completely light and power the city of Chicago for 200 years. What does this mean to you? It means a *dependable* source of fuel from Peabody's huge reservoir of more than two billion tons of coal. A continuous acquisition program of productive mining properties . . . economically accessible to the nation's inland waterways and rail facilities . . . assures Peabody customers long-term high-productivity and diversified selection. May we be of service to YOU?

Get your free booklet, "This Is Peabody Coal Company", and learn more facts about PEABODY and its complete coal service. Write Department EW.

power for progress

PEABODY COAL COMPANY

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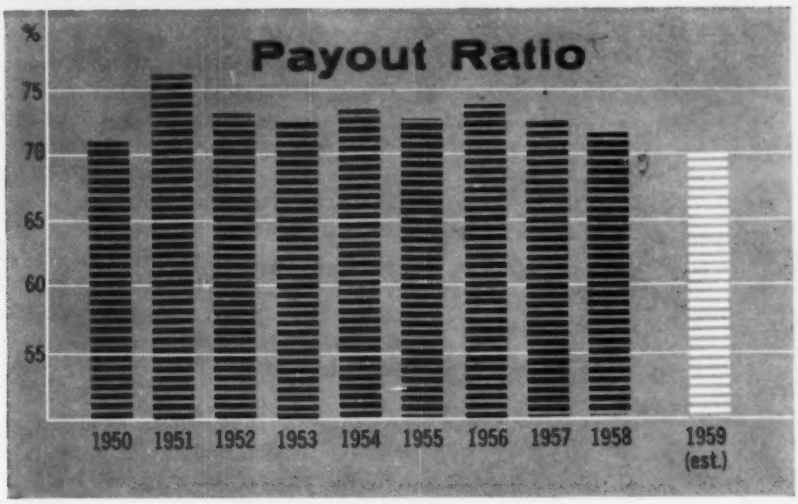


A multi-million-dollar question for utilities . . .

High Dividend Payout or Low?

Report on Finance

To pay or not to pay higher dividends has been a controversial question among utility financial men for decades. And today the two schools of thought remain equally earnest and ardent. Both the "highpayouters" and the "lowpayouters" have steadfastly clung to their views, and converts among the experts have been few indeed. Who is right? Like most longstanding arguments, there's no clear-cut answer to cover all situations. The industry's average payout ratio has been showing a slight gradual decline, but different payout philosophies seem to ring the bell for different companies. Each side of the controversy can produce evidence and statistics to prove that their own contention is the correct one, and different market conditions seem to point to different answers.

No answer can be made to apply to all companies. But the general concepts—the basic arguments for and against high payout of dividends and the reasoning behind them—are worth considering as a background against which to hold the special circumstances of a particular company. Also worth considering is the relationship between payout and market value that shows up in today's market.

The basic disagreement hinges on the market's reaction to higher dividends. The "highpayouters" assert that higher dividends inevitably improve the market price of a company's stock and therefore create two valuable advantages: (1) Greater market values for the stockholders' shares; and (2) Lower cost of common stock money to the company when it has to raise it. "Lowpayouters," on the other hand, say there's nothing inevitable about an increase in market price after a dividend increase. Further, they claim that any such increase is obtained at the expense of more enduring values which would be created by retaining a greater proportion of the earnings in the business—improving the company's common stock equity ratio and enhancing the "quality" of the stock.

High payout would seem to offer most to a fast-growing company, if the "highpayouters'" argument is sound, since such a company would be forced to sell more common than would a company with a less rapid rate of growth. But the "lowpayouters" submit that a lower dividend would leave retained earnings able to play a bigger role in financing expansion and reduce the amount of

common that would have to be sold. "Why should a company put itself in the position of having to sell common stock in order to pay an increased dividend?" they ask.

The "highpayouters" quickly reply to this with the contention that (1) The earnings belong, fundamentally, to the stockholders; (2) The dividend increase merely distributes to stockholders more nearly what they should receive; and (3) Therefore, any stock sold is being sold to raise cash for expansion and not to finance the dividend increase. This line of argument reaches its extreme in a proposal expressed not long ago in one of the technical accounting magazines: The author went so far as to contend that any company that did not pay out all its earnings in the form of dividends was short-circuiting the free-enterprise system by compelling stockholders to invest their earnings in the business without their consent. Morally, he said, it would be more proper for the company to pay out all earnings and then go into the open market to raise all new capital at the going rate.

The "lowpayouters' " most convincing argument concerns the value of "quality." As important as the dividend rate, they say, is the equity ratio. And every dollar that is withheld from dividends helps to build up the stockholders' equity and the "quality" of the stock. This "quality" is nothing to sneer at, the "lowpayouters" assert. In the first place, many institutional and individual investors select electric utility equities because of their stable earnings and good defensive characteristics. The utilities find their place in these portfolios as a good, conservative investment. Hence such investors in the industry favor those managements which follow conservative policies—including the maintenance of a high equity ratio. This argument is actually not as nebulous as it sounds, for some investors make a fetish of words and sometimes allow themselves to be influenced more by an adjective such as "conservative" than by a thoughtful analysis of the stock.

More tangibly, the "lowpayouters" point out, a high equity ratio is a valuable cushion for possible future use in times when the market is down but the company needs to raise common stock money. Under such circumstances, they urge, the conservative company can get away with a sale of senior securities at a substantially lower cost, reducing the common equity ratio but still maintaining it above a dangerous level. The company without such a cushion might well be forced to go ahead with the stock issue, despite the unfavorable conditions.

How do the facts substantiate the claims of each party? Obviously each company must decide based on its own situation, but the market performance of a large group of utilities in the past few months provides meat for some interesting generalizations. The New York investment dealers, G. A. Saxton & Co, publish monthly a detailed statistical tabulation covering 116 operating electric companies and showing (among many other items) the common stock equity ratio, dividend payout, and price/earnings ratio of each. The relationship in October between these three quantities is shown in the tables opposite, with companies divided by size into three groups.

Data on the large companies tend to support both contentions. Only five of the 38 large companies in Saxton's list paid out less than 60%. Among the other 33 companies, 13 paid between 60% and 70%, twelve paid between 70% and 80%, and eight paid more than 80%. In the three latter groups, a higher price/earnings ratio does seem to accompany a more liberal dividend payout. The difference between payout in the sixties and payout in the seventies is slight (about 1%), but those companies which pay out more than 80% enjoy a 5% edge in P/E ratio. The equity ratios arrange themselves into a similar pattern for the large companies. The group with equity ratios falling between 35% and

Relation of Price Earnings Ratio to Dividend Payout

	Percent Dividend Payout				
	<50%	50–60%	60–70%	70–80%	>80%
Large Companies (Revenues $60 Million)					
Number of Companies	1	4	13	12	8
Average P/E Ratio	25.3	17.1	16.6	16.8	17.7
Medium-Sized Companies (Revenues from $25 Million to $60 Million)					
Number of Companies	....	5	15	17	4
Average P/E Ratio	....	14.7	17.3	17.4	18.0
Small Companies (Revenues $25 Million)					
Number of Companies	....	3	13	13	8
Average P/E Ratio	....	15.6	14.1	17.7	17.7

Relation of Price/Earnings Ratio to Common Equity Ratio

	Percent Common Equity			
	<35%	35–40%	40–45%	>45%
Large Companies (Revenues $60 Million)				
Number of Companies	12	15	9	2
Average P/E Ratio	16.4	16.6	18.6	20.2
Medium-Sized Companies (Revenues from $25 Million to $60 Million)				
Number of Companies	26	8	3	4
Average P/E Ratio	17.4	16.1	16.9	17.6
Small Companies (Revenues $25 Million)				
Number of Companies	18	11	5	3
Average P/E Ratio	16.3	15.8	15.0	19.9

40% has about a 1% advantage in average P/E ratio over the companies with equity ratios of less than 35%; and the 40-45% bracket shows a bigger advantage (more than 10%) over the 35-40% group.

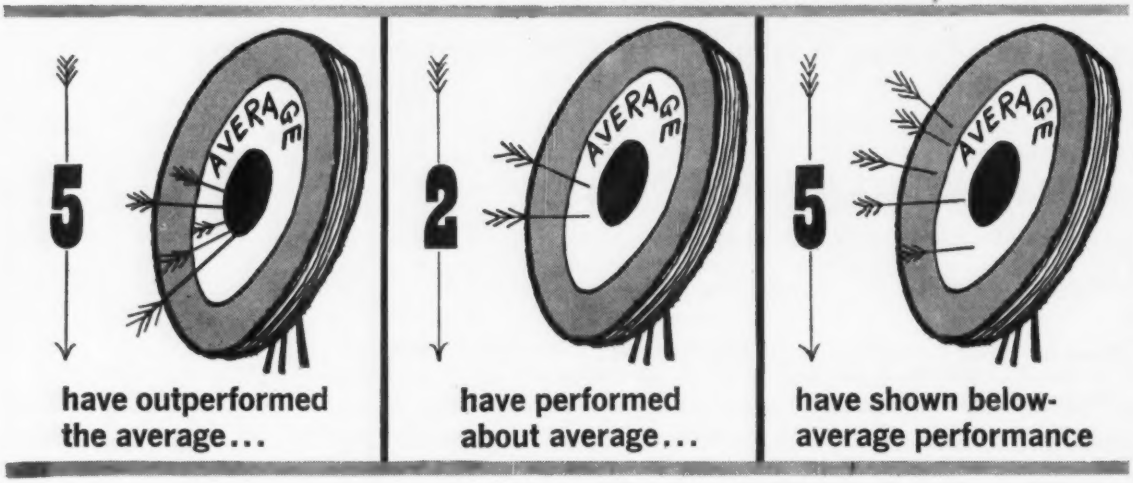
The middle-sized companies don't follow the form so closely, however. Payout and P/E ratio show an even neater relationship than in the large companies, but

the tie-in between equity ratio and P/E ratio begins to break down. The bulk of the middle-sized group, with equity ratios of less than 35%, sports an average price/earnings ratio of 17.4, while the more "conservative" remainder (with equity ratios of more than 35%) have an average price/earnings ratio of only about 16.5.

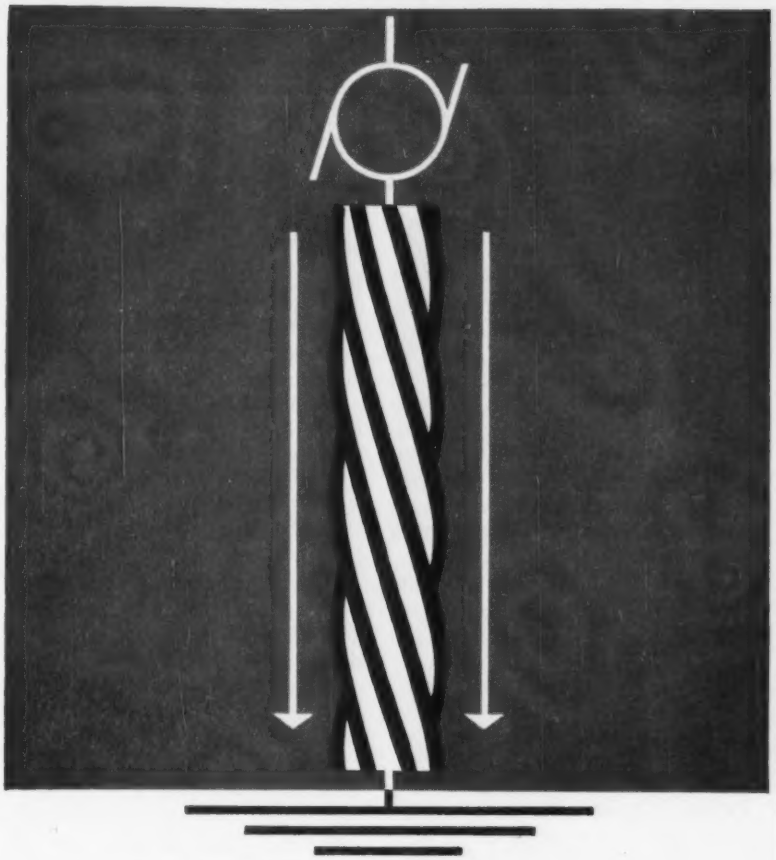
The smaller companies arrange themselves in a still more paradoxical pattern. Below-average dividend payout is associated with low P/E ratio (the 70-80% group shows an average P/E more than 25% greater than the 60-70% group.) But those companies paying out more than 80% show the same average P/E as the ones with payout between 70% and 80%. Equity ratios among the smaller companies, meanwhile, show an *inverse* relationship with price/earnings ratio. Excepting a splinter group of three companies with more than 45% equity, the tabulation indicates that the lower the equity ratio of a small utility company, the more investors are willing to pay for a dollar of earnings. This is, of course, a prime example of the hazard of reading too much into a set of figures. But it does hint that conservatism may not be so important to the investor in a small utility as it apparently is to the investor in a large company.

A Dividend Hike Does Not Guarantee a Good Market

Of 12 utilities that have recently raised their dividends...



One further bit of evidence that dividend policy can't be decided by rule shows up in the chart above. The question: How much good does it do to raise the dividend shortly before offering common stock for sale? A spot check of the market performance of twelve utilities that raised their dividend during the summer showed that two months after the announcement five companies had outperformed the Dow-Jones utility average, five had performed worse than the average, and two had done just about the same as the average. Admittedly, this sample is too small to use as a basis for sweeping conclusions, and no attempt has been made to evaluate other factors affecting the prices of these stocks; but the mixed results do show that increasing the dividend will not guarantee good market performance, and that the wise management will only make such a move after careful consideration of the company's particular situation and the conditions of the market at the time.



It's safe... it's grounded with

CF&I Galvanized Steel Strand

When grounding electrical installations, you can't afford to use "second best" wire. Insist on a dependable steel strand that will give years of trouble-free service — CF&I Galvanized Steel Strand. Woven in seven- or three-wire constructions, CF&I Galvanized Steel Strand is made in accordance with ASTM Specification A-363 zinc coated steel Overhead Ground-Wire Strand.

For guy, messenger and other applications we recommend ASTM Specification A-122. *CF&I is also prepared to produce uniformly galvanized strand to your own specifications.*

Remember . . . for quick delivery and complete information, call the nearby CF&I sales office or your local electrical distributor.

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION — Albuquerque · Amarillo · Billings · Boise Butte · Denver · El Paso · Farmington (N. M.) · Ft. Worth · Houston Kansas City · Lincoln · Los Angeles · Oakland · Oklahoma City Phoenix · Portland · Pueblo · Salt Lake City · San Francisco San Leandro · Seattle · Spokane · Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION — Atlanta · Boston Buffalo · Chicago · Detroit · New Orleans · New York · Philadelphia

CF&I OFFICE IN CANADA: Montreal

CANADIAN REPRESENTATIVES AT: Calgary · Edmonton · Vancouver · Winnipeg

6968

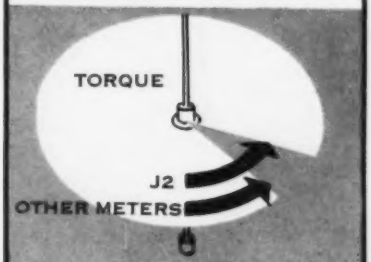
METERMAN'S CHECK LIST

Get Sustained Accuracy Even as System Capacity Grows

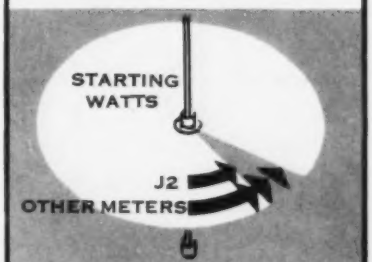
Sangamo J2 Watthour Meters provide the long-life accuracy that is so essential as test intervals lengthen and residential loads increase. Uniform load curves from 1.5 through full 200 amperes prove the J2's sustained, "straight line" accuracy on both light and heavy loads.

The J2, with its slow speed, exceptionally high torque, and ability to begin measuring on fewer starting watts than other meters, provides unexcelled extended range metering for all services, present and potential.

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS



UP TO 15%
MORE TORQUE



UP TO 25%
LESS STARTING WATTS

LBE 1960 Program Features Electric Heating

Greater emphasis will be given to electric heating and cooling in Edison Electric institute's $3 million 1960 Live Better Electrically Program.

This was echoed by two men recently in announcing the plans for next year's promotion.

Stress will be given to load-building appliances such as ranges, dryers, water heaters and house heating equipment, where the electric industry has demonstrable competitive advantage over other types of fuel, according to Allen S. King, EEI president, and president, Northern States Power Co. "Our aim is to capitalize on the sharp up-surge in public demand for total electric living," he said.

In an interesting, figure-packed speech before the Wisconsin Utilities Assn's Electric Sales Section, W. E. Pierce, Commonwealth Edison Co's advertising manager, and chairman of EEI's Advertising Committee, detailed the program's plans for 1960.

Pierce told the group that the campaign will be known as the Live Better Electrically Program, "a single, coordinated activity to support the entire electrical industry."

In an attempt to achieve unification with a single, effective program at the consumer level, the 1960 appliance, Medallion Home, Light for Living, and Housepower programs will appear as one Live Better Electrically campaign. Also, particular stress will be placed on the highly competitive load building areas.

The scope of the program will be broadened, according to Pierce. The Medallion Home will now be dependent on EEI national leadership, and residential electric heating and cooling will receive increased emphasis.

Major advertising media will be used: *Life, Saturday Evening Post,* and *Better Homes and Gardens* magazines, and daytime network television. Magazine advertising will carry the theme, "Electricity is your better way . . ." with appropriate taglines such as "wash and dry," or "heat and cook."

Local Promotions Planned

The national promotion will also support local selling programs with key activities.

An All-Electric Kitchen Carnival in March and April will merchandise dishwashers, refrigerator-freezers, ranges, and water heaters. A complete promotional package for use in organizing local programs will be available to utilities this December.

The kit will contain a utility planning guide, local advertising materials, complete dealer presentation, point-of-sales displays, dealer sales aids, traffic building gimmicks and premiums. The National Electrical Manufacturers Assn will provide materials on specific products.

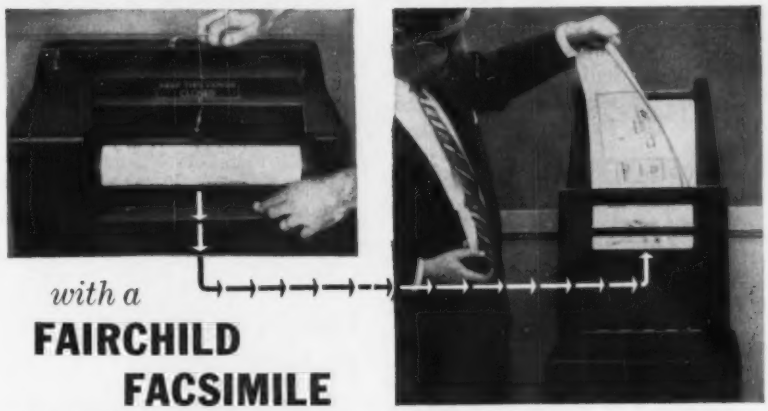
The All-Electric Laundry promotion in September and October will emphasize electric dryers, with smaller accent on water heaters. A full promotion kit will be ready for utilities in May.

(*Continued on page* 112)

ELECTRICITY
is your better way to cook!
Each gently glowing surface unit of your modern electric range puts the heat where you want it—in the food, not in your kitchen. With electricity, there's never a flame to go out. And there's no waste—electricity is today's biggest bargain in your budget!
Summertime, or any time, electric cooking is a joy. Modern electric ovens, insulated on all sides, keep your kitchen cool as a breeze. And even the air in your all-electric kitchen stays garden-fresh all day long. (Flowers won't wilt—neither will you.)
Electricity's measured, even heat and perfect timing make cooking sure and easy. Your foods taste better, too. Set your electric range and let it cook for you!
SEE YOUR DEALER NOW DURING THE ALL-ELECTRIC KITCHEN CARNIVAL
CLEANER You'll live in your spotless, all-electric kitchen. Your electric range just can't make pots and pans sooty—they stay as bright as new. Kitchen walls and curtains stay cleaner longer.
Building, buying, modernizing? Qualify your home for this Live Better Electrically Medallion, symbol of modern living with Electric Appliances, Light-for-Living, and Full HOUSEPOWER.
LIVE BETTER... ELECTRICALLY

LBE ADS for 1960 campaign will carry theme, "Electricity is your better way . . ." Magazine and TV advertising will be slanted to feminine audience

transmit **ANY** *data* **ANY** *distance*



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FAIRCHILD FACSIMILE COMMUNICATION SYSTEM

• *in minutes* • *without error* • *in sharp detail*

Now you can break the time barrier—intra-plant or coast-to-coast—of interchanging any kind of visual data in volume. With a Fairchild facsimile communication system, planned to serve your specific needs, you can transmit engineering drawings, change orders, blueprints, charts, sketches, memos, schedules, specifications, photos, contracts, invoices, shipping orders, forms, letters. You can use short wave radio, telephone, leased wire or microwave transmission. You can transmit data rapidly and dependably, without error, and with the sharpest detail available today.

Electric-utility applications

Electric power companies can increase the return on their microwave equipment, already used for such services as voice telephony, telemetering, supervisory control, load-frequency control, and protective relaying. With Fairchild Facsimile, microwave can also be used to transmit data-logging reports, photos and maps, centralized bookkeeping and billing data, engineering drawings, etc. The recording paper used, translucent and lightweight, makes an excellent original for any diazo-type office copier.

Nationwide service

Operation? Just attach the copy, set the scanner, press a button, and in less than 6 minutes transmission is completed at the receiving end. Reliability? It has served the demanding needs of the newspaper industry for over 20 years. Service? Fairchild offers an established nationwide organization, unequalled in this field, that includes 56 experienced service specialists. Cost? An attractive lease arrangement covers preventive maintenance, periodic equipment updating, and replacement options as improved models are developed. For full information, mail coupon now for brochure "To Deliver the Facts...Fast."

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Please send me "To Deliver the Facts . . . Fast."

Name_____

Title_____

Company_____

Street_____

City_____ Zone_____ State_____

METERMAN'S CHECK LIST

Get Consistent Overload Accuracy and Reduced Wear

Sangamo J2 Watthour Meters are the only meters that match slower disk speed with increased overload capacity. The result: more uniform load curves, and reduced wear on all moving parts, fewer repairs and replacements, longer meter life, more economy.

64,000 fewer revolutions per day

In one day, the disk of a conventional Class 100 meter operating at full capacity makes 160,000 revolutions. The J2 makes 64,000 fewer. Actually, the J2 makes only 10 revolutions per minute at full name-plate rating. That's a full 40% slower than any other meter.

SANGAMO
Electric Company
SPRINGFIELD, ILLINOIS

LBE Program Features Electric Heating

(*Continued from page* 110)

Christmas appliance promotion will also figure in LBE's 1960 schedule. A Give Better Electrically "advertacular" will appear in a November, 1960 issue of the *Saturday Evening Post*. Three new features have been added "to make next year's spectacular even more appealing to appliance manufacturers and the public," according to Pierce.

- EEI will take the full center spread
- Products of participating manufacturers will be featured in the spread, giving the advertiser "double visibility" for his product
- The manufacturer will feature his product ad in a booklet insert which will be easily detachable by readers for use as a buying guide

The promotional campaign, based on the title of the booklet, will be called the All-Electric Christmas Fair.

Four-color ads in April, May, and June will stress benefits of electric heating and cooling and establish the concept of the Total Electric Gold Medallion Home. A second series of ads, devoted strictly to heating, will appear in May, June and July.

Lighting Ads Planned

Light for Living will figure in the 1960 program with a student architects' contest, running from this fall to Jan. 15, 1960. The competition calls for judging of house plans for mass-appeal, tract-builder, electrically heated homes in the $15,000 class. Award-winning designs will be used in connection with the Medallion Home advertising.

Four full-color ads on lighting will be run next year in March, May, September and October. In addition, there will be a unique local promotion on lighting in the spring, 1960. Plans will be announced later.

Promotion of Housepower in 1960 will play down the symptoms of faulty wiring and shift to the end use benefits of full Housepower. Ads will talk about the four-season benefits, kitchen and laundry benefits, etc. of having complete adequate wiring.

The Medallion Home phase will receive important emphasis next year because, "it's really the wrap-up for the whole campaign; because all aspects of all-electric living come together in the Medallion," Pierce said. "This hallmark of excellence is the rallying point for the coordinated local activity in both new construction and modernization markets."

The big news on Medallion Homes will be a "super-spectacular" during National Home Week next September. The ad will offer participation to electrical manufacturers, but EEI will pay for all editorial-style pages. There will also be a $100,000 Total Electric Gold Medallion Home contest with four homes as first prizes.

The 1960 advertising budget will be increased 50%, according to Pierce.

Commonwealth Edison Launches Dryer Campaign

Commonwealth Edison Co has launched a fall drive to sell electric clothes dryers on a "satisfaction guaranteed" basis. During the 12-week promotion the utility will back local dealer sales with a certified money-back guarantee and a low-cost installation.

Sixty-day home trials will be offered to all residential customers who buy participating brands of 240-v dryers.

In addition to the money-back guarantee, Edison will stress the lower initial cost and exclusive advantages of electric dryers in their company advertising. Purchasers will be given gold certificates of satisfaction endorsed by the utility.

Utilities Urged to Push Air Conditioning

There are 50 million wired homes in America and each one is a potential customer for residential air conditioning, according to Joseph B. Ogden, vice president in charge of sales for the Airtemp Division of Chrysler Corp. Utilities will have to cooperate with manufacturers in developing the residential market though, he said.

Central home air conditioning has failed to live up to expectations, Ogden noted. This is because no one has hit the "hot button"—a basic appeal to convince homeowners that they need central air conditioning as much as TV, refrigerator or stove.

Once this key is found, Ogden said, sales of residential units will soar and "become the marketing phenomenon of its era."

Laundry Appliance Sales Up 14% in August

Home laundry appliance sales were up 14% in August, compared to a year ago, according to the American Home Laundry Manufacturer's Assn.

Total factory sales for the first eight months of 1959 were 3,339,056 units, 18% greater than the same period for 1958.

Sales by products for August:

Combination washer-dryer: 18,179 units, up 88% from July, and 33% from August, 1958.

Total Washers: 359,849, up 13% from July, 10% from August, 1958.

Automatic and semi-automatic washers: 270,332 units, up 8% from July, 10% from August, 1958.

Wringer and all other washers: 89,517 units, up 34% from July, and 12% from last August.

Total dryers: 133,197 units, a 40% increase from July and 21% from August, 1958.

Electric dryers: 87,291 units, up 31% from July, and up 21% from August, 1958.

Photoswitch Developed

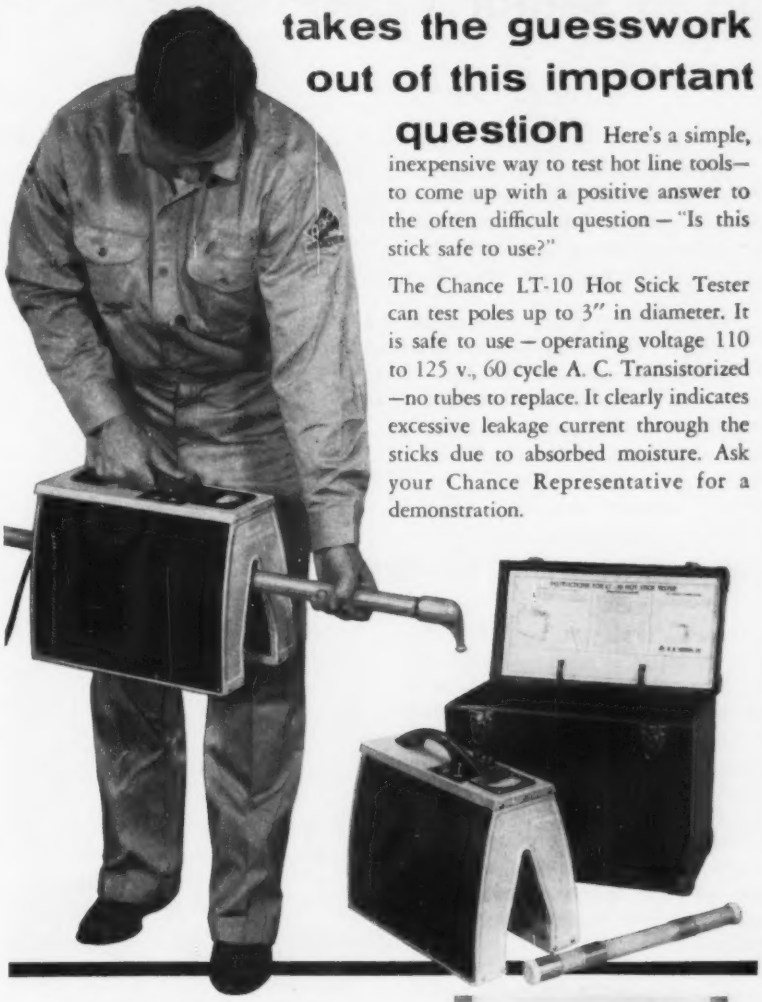
A 1¾ in. photoswitch has been developed by a Texas manufacturer. Designed to turn off at one ft-c and on at ten, the Lightguard can be installed in post lanterns, lighting fixture canopies, outlet boxes, and within magnetic contactors and starter cabinets. Current models are suitable for tungsten loads up to 150 w on 120 v ac. The location of the light sensitive element can be varied. A 3-in. adapter is available for post lantern mounting. The unit was designed by E. L. Schacht, Schacht Electric Co, 1213 St. Emanuel, Houston 3, Texas.

ARE YOUR HOT STICKS SAFE?

Chance Portable Hot Stick Tester takes the guesswork out of this important question

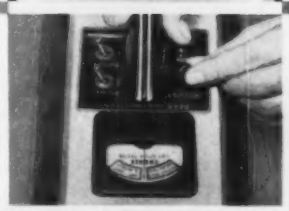
Here's a simple, inexpensive way to test hot line tools—to come up with a positive answer to the often difficult question—"Is this stick safe to use?"

The Chance LT-10 Hot Stick Tester can test poles up to 3" in diameter. It is safe to use—operating voltage 110 to 125 v., 60 cycle A. C. Transistorized—no tubes to replace. It clearly indicates excessive leakage current through the sticks due to absorbed moisture. Ask your Chance Representative for a demonstration.



EASY TO OPERATE. A simple single dial shows whether the tool is safe to use or whether the tool should be dried and re-tested. A number of readings along the pole test every foot for safety.

EASY TO CALIBRATE. You can always be sure that the tester is accurately calibrated. Just press the "PUSH TO CALIBRATE" button and turn "ADJUST" knob until needle is centered on dial. A calibration standard is furnished with the unit for positive double-checking.



ABC INDUSTRIES

A. B. CHANCE CO.

CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

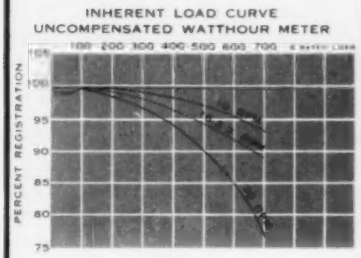
CH59-16

METERMAN'S CHECK LIST

Greater Overload Capacity With Less Compensation

The Sangamo J2 Watthour Meter needs less compensation for "straight-line" accuracy. Its individual overload curves are more uniform, too.

These built-in "plusses" come from the J2's slow, 10 revolutions-per-minute disk speed. Check this: current damping, which varies directly with the current flux squared and the disk speed, causes the phenomena of reduced registration on higher loads. With a slow speed J2, current damping plays a smaller role in overload accuracy.



As can be seen from the curves on the graph, the inherent load curve of an uncompensated 10 rpm meter is substantially better than meters with higher speeds. The slow speed of the J2 also reduces wear on moving parts.

SANGAMO
Electric Company
SPRINGFIELD, ILLINOIS

Norman Promoted to Senior Vice President

Harold E. Norman has been promoted to senior vice president and treasurer at Black Hills Power & Light Co.

He has been with the power company and its predecessors since 1921. Beginning in the company's accounting department, he next served as local manager at Deadwood, S. D., and later as company auditor.

Norman was made treasurer of the utility in 1954 and a vice president in 1957.

A 1920 graduate of Creighton University, he is a member of the Rapid City Planning Commission, and active in local civic groups. He is also assistant treasurer of the Wyodak Resources Development Corp, a wholly owned subsidiary of Black Hills P&L.

Scott Elected President of Arkansas Cooperative

First Electric Cooperative of Jacksonville, Ark., has elected Milton Scott president. He will fill the unexpired term of Robert L. Henry who died in September. Fred West, Letona, was selected to succeed Scott as vice president of the 11,000-member utility which serves 13 central Arkansas counties.

Scott has served on the Board of Directors since 1939 when the Saline County district was added to the cooperative service area. A dairyman, Scott is on the executive board of the Central Arkansas Milk Producers Assn, a director of the Saline County Farm Bureau, and president of the Saline County Fair Assn.

West has represented White County on First Electric's board since 1941. He is mayor of Letona, vice president of the Searcy School Board, and chairman of the White County Welfare Board.

Henry was a pioneer leader in the rural electrification movement and served as First Electric's first and only president until the time of his death.

Anaconda Wire & Cable Names Steinmetz President

Richard B. Steinmetz has been elected president of Anaconda Wire & Cable Co, a subsidiary of The Anaconda Co. He succeeds William E. Sprackling who is retiring.

Steinmetz has been associated with Anaconda since 1929, first in electrical engineering assignments and then as a district sales engineer.

During World War II he was a special Washington, D. C. representative handling Army and Navy wire requirements. In 1946, he became sales manager for the Marion, Ind., mill, and, in 1948, was named its manager.

He became general manager of all mills in 1951; vice president in charge of manufacturing operations in 1952; and executive vice president in 1957.

Sprackling, an All-American at Brown University for three years, has been with Anaconda Wire & Cable since the company was formed in 1929. He served as vice president and executive vice president before being named president in 1957.

PLASTIMAYD
AERIAL TENTS

TRANSLUCENT! Actually intensifies daylight by diffusion.

WATERPROOF! Durable KRENE vinyl, seams electronically Super-Welded*

SAFE! 20-gauge KRENE has dielectric resistance to 16,000 V. Conforms with FFA Public Law 88.

GUARD COVER Full weather protection without loss of daylight

*TM

PLASTIMAYD CORPORATION
2204 S. E. 7th Avenue, Portland 14, Oregon

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

EVERSTICK ANCHORS

For new construction and maintenance — Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resiliant, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

PERSONAL BRIEFS

E. Bruce Shuler named superintendent of Duke Power Co's transmission lines.

Idaho Power Co appointed **Milton T. Sargent** assistant manager of the Eastern Division.

Georgia Power Co has named **Robert W. Scherer** assistant to H. M. Oldham, vice president and division manager, Rome Division. **Walter M. Lovett** becomes Augusta division rural engineer, succeeding **L. C. Weissinger,** who has been transferred to Rome as division rural engineer.

Paul E. Davis, Jr, has been promoted to general line engineer of the Carolina Power & Light Co.

Jack McIsaac, former Yakima, Wash., newspaperman, joins Pacific Power & Light Co's advertising department as advertising assistant. PP&L promotes **Ervin E. Smith** to supervisor of the electronic data processing customer accounting division.

Willard R. Holland, superintendent of utilities at Madisonville, Ky., resigns to accept a utilities post in Cookeville, Tenn.

Iowa-Southern Utilities Co appoints **Harold Miskimins** as assistant to Paul D. Anderson, purchasing agent.

Jack R. McClendon is promoted to district engineer in the Connecticut Light & Power Co's Meriden district.

Four engineering scientists have joined the University of California: **Dr. Thomas H. Pigford,** professor of nuclear engineering; **Dr. Lofti A. Zadeh,** professor of electrical engineering; **Dr. Charles K. Birdsall,** associate professor of electrical engineering; and **Georg Bruun,** acting associate professor of electrical engineering.

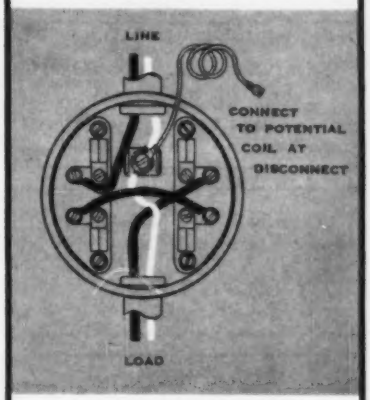
Oklahoma Gas & Electric Co has made these promotions: **John Holtsclaw** to assistant supervisor of meters; **O. H. Washam,** Norman district superintendent; **Warren St.**

(*Continued on page* 117)

METERMAN'S CHECK LIST

Protect Today's Investment in 2-Wire Services

Sangamo J2 Watthour Meters are designed so that standard 3-wire meters can be installed on 2-wire service by simple socket connections.



All connections are external, make conversion from 2-wire to 3-wire service simple. The same meter is used for the new 3-wire service; there are no returns to the shop for conversion. The J2 eliminates the need to retire meters before their time, protects investments in 2-wire services, reduces and simplifies stock inventory.

SANGAMO
Electric Company
SPRINGFIELD, ILLINOIS

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CONSULTING · DESIGN · EXAMINATIONS · APPRAISALS
CONSTRUCTION · PLANS · SURVEY · REPORTS

AMERICAN AIR SURVEYS, INC.
- Aerial Topographic Maps & Photos
- Plan & Profile for Transmission Lines
- Aerial Stereo-photos for Planning
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A NATIONWIDE SERVICE
907 Penn Avenue — Pittsburgh 22, Pa.

BLACK & VEATCH
Consulting Engineers
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Reports, Design, Supervision of Construction
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THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood Transmission Lines
Distribution & Maintenance
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BURNS and ROE, Inc.
Engineering and Design • Reports • Surveys
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300 Park Ave.
New York 22, N. Y.

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Consulting and Design Engineers
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Jackson, Michigan

DAY & ZIMMERMAN, INC.
Engineers
Design—Construction
Transmission—Distribution Lines
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DOBLE ENGINEERING COMPANY
Electrical Insulation Engineers
Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications
Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr., Chicago, Ill.

ELECTRICAL TESTING LABORATORIES, INC.
Electrical, Electronic, Environmental, Photometric and Chemical Laboratories. Testing, Research, inspection and Certification.
2 East End Ave. — New York 21, N. Y.

READERS MAY CONTACT

the consultants whose cards appear on this page with the confidence justified by the offering of these special services NATIONALLY.

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Michigan Theatre Building Ann Arbor, Michigan
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140 South Dearborn St.
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Consulting Engineers
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Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1323 North Second Street — Abilene, Texas

UTILITIES LINE CONSTRUCTION COMPANY, INC.
Construction and Maintenance
Transmission - Distribution
Electric and Telephone Lines
Consultants
595 York Road — Jenkintown, Pa.

VERNON GRAPHICS, INC.
Mount Vernon, N. Y.
MO 4-7117

VERNON GRAPHICS OF PA. INC.
Norristown, Pa.
Broadway 9-3000

CONSULTING AND SERVICING UTILITIES ON MAPS, RECORDS AND FIELD INVENTORY

George, supervisor of the newly formed western division substation department; **David Reed,** chief electrician at Shawnee; **J. Glenn Cartwright,** tax auditor; **Joel J. McGinnis,** engineer in the general offices; and **Clyde G. Farmer,** Mustang station electrical engineer.

Chester Cable Corp appointed **James Henderson** as plant superintendent.

James W. Wilcock has been appointed manager of the Sturtevant division of Westinghouse Electric Corp. **Drayton Heard, Jr.,** has been made sales promotion manager of Westinghouse's northeastern apparatus sales region. Other Westinghouse appointments: **Willard F. Davis,** manager of the Belgian nuclear reactor project at the company's atomic power department; **Robert K. Morton,** manager of research and planning; **E. L. Murphy,** regional representative in South Africa for Westinghouse International; **L. P. Greulich,** assistant director of Middle East area sales; **Philip F. Dietz,** manager of the Rayescent lamp department; **Paul J. Bridwell,** manager of apparatus sales promotion; **Charles W. Van Eman,** manager of industrial products advertising; **Leo J. Besch,** manager of power transformer quality control department; and **John H. Bell,** assistant manager.

Moloney Electric Co announces the creation of a new group to be known as Advanced Design Engineering under the head of **Virgil F. Christen.** Other members are: **William G. Hobusch** and **Lawrence W. Petty.** The group's specific assignment is to plan, conduct, and consolidate an advanced program for power transformers.

Ohio Brass Co has made these recent personnel changes: **W. H. Burleson,** formerly manager of the power utilities department, becomes a consultant to the general sales department on extra-high voltage transmission projects. Succeeding Burleson as manager is **Paul M. Ross. Robert A. LeFevre** becomes manager of marketing services, a new position.

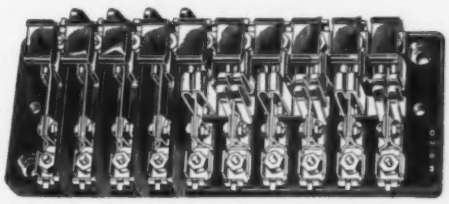
John S. Harbison has been named general merchandising manager of the Automotive Division of the Electric Storage Battery Co.

OBITUARY

Everett A. Page, 77, former credit manager of the Northern Ohio Power & Light Co . . . **Volney B. Fowler,** 62, director of public relations for Electro-Motive Division of General Motors . . . **William Hillard Hooper,** 52, manager of the Mississippi Power & Light Co office in Kosciusko . . . **Harold F. Webb,** 67, retired director of safety of West Penn Power Co . . . **Lloyd Edenfield,** 60, staff engineer at Public Electric & Gas Co . . . **Joseph E. Spink,** for many years secretary of the Sacramento Municipal Utility District and most recently head of a civil engineering firm in Sacramento, Calif.

Melville S. Church, supervisor for Potomac Electric Co . . . **John Sturgis Codman,** 91, active in illuminating in his early engineering work in Boston.

(*More News About People, p* 119)



"READY-TEST" FEATURE
(back-off-screw) or
"BLADE-THRU-JACK" Type
METER TEST SWITCHES
IMMEDIATE DELIVERY

MAKERS OF FAMOUS Roto-Test SWITCHES

Standard Catalog types or your specifications. See our Bulletin 492 . . . or write . . . or phone GLendale 2-3497

LARGEST EXCLUSIVE MANUFACTURERS OF METER TESTING DEVICES . . . .

SWITCHES
ENCLOSURES
ACCESSORIES

METER DEVICES
COMPANY • CANTON, OHIO

METERMAN'S CHECK LIST

Sectionalized Meter Construction Means Lower Costs

Sangamo J2 Watthour Meters are designed to perform indefinitely without maintenance. When, rarely, a J2 needs minor repairs, the job is simple. The J2 is constructed with easy-to-assemble units. Any component can be inspected or replaced without completely disassembling the meter.

Position and alignment of the disk and magnet always remain the same, and the register is properly located with simple locking levers. And, it's a snap to calibrate the J2 when it is reassembled. This ease of service means lower labor costs.

SANGAMO
Electric Company
SPRINGFIELD, ILLINOIS

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE:

EMPLOYMENT OPPORTUNITIES: $22.67 per inch. Subject to Agency Commission.

EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

UNDISPLAYED RATE:

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

SEND NEW ADVERTISEMENTS TO Classified Advertising Div. of ELECTRICAL WORLD, P. O. Box 12, N. Y. 36, N. Y.

SUBSTATION EQUIPMENT

TRANSFORMERS

QU	KVA	MFR	VOLTAGE
1	12000	G.E.	115,000—46,000 L.T.C.
1	10000	West.	67,000—34,500, 3 Ph. Auto
1	3750	G.E.	69,300—13,200, 3 Ph.
1	3000	G.E.	69,000—4340, 3 Ph.
3	500	G.E.	66,000/33,000—2300/13200
3	500	Wagner	60,000—460
4	333	West.	67,000—7200
1	2500	Mol.	44,000—2400/4160, 3 Ph.
2	2500	Wagner	45,800/2,900—4160Y, 3 Ph.
3	200	West.	44,000—480
1	5000	West.	34,500—13750/6875, 3 Ph.
1	4500	West.	33,000—2500/4330, 3 Ph.
2	3000	Upef.	34,750—4160, 3 Ph.
2	1500	G.E.	34,400—2520, 3 Ph.
3	1250	A.C.	33,000—480
3	500	Mol.	34,500—2300/4600
3	200	A.C.	34,500—2400/7200/12470Y
3	200	Wagner	34,500—240
2	2500	Wagner	22,900—4160/2400, 3 Ph.
2	1500	G.E.	23,000—2400/4800, 3 Ph.
1	7500	A.C.	13,800—2400, 3 Ph.
2	3000	G.E.	13,800—2640, 3 Ph.
1	2500	G.E.	13,800—2400, Unit Sub.
3	1000	G.E.	13,800—600, L.C. Sub.
1	600	Stand.	13,200—2300, 3 Ph.
1	450	Penna.	13,200—2400, 3 Ph. Askarel
3	333	G.E.	13,200/22,800Y—2420/4190Y
1	500	Kuhl.	4,800—480, 3 Ph.
3	100	G.E.	4,800—120/240
1	1000	A.C.	2400/4160—240, 3 Ph.
3	400	G.E.	2300/4800—230/460

FEEDER REGULATORS, 3 PH.—OUTDOOR

1	750	G.E.	360 A. 12,000 V. STEP
1	500	G.E.	694 A. 4,160 V. STEP
1	375	G.E.	50.2A. 34,500 V. STEP
1	250	A.C.	601 A. 2,400 V. STEP

Also: FREQUENCY CHANGERS, M-G SETS, SWITCHGEAR and CIRCUIT BREAKERS, ETC.

BREW, WOLTMAN & CO., INC.

52 Church Street — New York 7, N. Y.

TRANSFORMERS

3—2500 KVA G-E 69000—2300Y
3—2500 KVA G-E 69000—2400/4160Y
3—2500 KVA G-E 69000—7200/12470Y
4—2500 KVA W-H 34500—2400/4800
3—1500 KVA G-E 69000—2300Y
3—1500 KVA G-E 69000—2400/4160Y
3—1500 KVA G-E 69000—7200/12470Y
4—1000 KVA Mol 7200/12470Y—4160
3—333 KVA W-H 67000/69000—240x480
3—333 KVA G-E 66000—2400/4160Y
1—750/938 KVA G-E 3-Ph. 33000—6900Y—TCUL equip. fan cooling
1—1000 KVA W-H 3-Ph. 33000—7200Y TCUL equipped

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.

5316 Hetzel St.
Cincinnati 27, Ohio

47 Years' Dependable Service

Wanted—UTILITY ENGINEER

Electrical and Water Departments. Supervisory and Administrative ability essential. Resume of education and experience required. Address applications to:

Town of Greendale, P.O. Box 269
Lawrenceburg, Indiana

ELECTRICAL DESIGNERS

Require men experienced in designing conduit plans, cable systems, physical layouts, wiring diagrams, lighting systems, and other electrical features of hydroelectric powerplant design. Detailing and checking experience primary requirement. Send resume to Mr. James E. Collins, Personnel Manager.

Harza Engineering Company
400 W. Madison St., Chicago 6, Illinois

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS WANTED

Wanted — Graduate Electrical Engineers — Electric Utility in North Jersey area. Some experience in transmission and distribution desired. Please answer giving education, experience and salary expected. P-2345, Electrical World.

Electrical Engineer. Electrical Engineer with High Tension experience to manage Engineering Department for a manufacturer of Porcelain Insulators. Position includes full responsibility for design, testing and development of electrical porcelain. Replies confidential. P-2857, Electrical World.

Teaching position in E.E. Teach machinery courses, some graduate classes at night. Must have M.S. or Phd degree. Appointment in February. Contact head Electrical Eng. Dept. University of Akron, Akron 4, Ohio.

Administrative Engineer — Must have background in electric or gas utility field with successful record in supervisory or managerial capacity. Administrative ability essential. An unusual opportunity for a man with Electrical Engineering or Mechanical Engineering degree to use and develop all of his capabilities. Will manage and be responsible for all operations in his district. Location — Southwest. Reply sending a complete resume to P-2981, Electrical World.

SELLING OPPORTUNITIES OFFERED

Representative wanted for manufacturer of street lighting equipment pole line specialties. Full particulars. RW-9821, Electrical World.

Manufacturer's Agent—To represent old, established manufacturer of high tension, wet process electrical porcelain specialties (no standard insulator line) in Eastern Pennsylvania, New Jersey, Metropolitan New York, Delaware and Virginia. In replying, please give age and send recent photo. RW-2770, Electrical World.

TRANSFORMER & PANEL

1500 KVA 4160 to 480V 3 phase Westinghouse type SL inerteen filled transformer 4—2½% taps Westinghouse distribution panel DB50—3 pole breakers 2000 a main bus—2—1200A 6—600A branch

INDUSTRIAL ELECTRIC & SUPPLY CO.
710 N. Main St., Memphis, Tenn. JA 7-1681

WHO'S WHO in—
Electrical Equipment Representatives

Write for copy of EERA Directory

C. W. SWARD, Executive Director EERA
1675 Fifth St. — Clermont, Florida

BUY • METERS • SELL

Atlantic Electric Meter Corp.

415 Lexington Ave., New York 17, N. Y.

SELL US Your New Usable Electric Wire and Cable

Send Us Your Listings.
Our Offering Will Follow Immediately.

PIERCE WIRE & CABLE CO.
2939 N. Paulina St. — Chicago 13, Ill.
EAstgate 7-4777

LARGE POWER EQUIPMENT

Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?

BELYEA COMPANY, INC.
51 Howell St. — Jersey City, N. J.
OL-3-3334

WANTED: USED

Conductor Tensioning Equipment

In good condition, send specifications with reply.

W-2982, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

New and Used Equipment Available for

POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION

Send for new list to

EBASCO SERVICES INCORPORATED

APPARATUS EXCHANGE — Two Rector St., New York 6, N. Y.

If there is anything you want
that other readers can supply
OR . . . something you don't want—
that other readers can use—
Advertise it in the
SEARCHLIGHT SECTION

SALES ASSIGNMENTS

COMPANY STAFFS

Leeds & Northrup has promoted Edwin A. Yeo, Jr., to assistant manager in the Sales Division; Willard H. Neu moves to district manager at Chicago; Manley S. Nolen to Pittsburgh district manager. Charles W. Sullivan becomes Cincinnati district manager; John C. Scott, Jr., branch manager at Columbus, Ohio, John C. Eckerline, St Louis district manager; John F. Sneath, technical assistant, field inquiries, Philadelphia; George J. Demos, branch manager, Baltimore; Philip H. Kuhl, resident engineer, Albany.

Graybar Electric Co has appointed Jerry T. Gravkin to the San Francisco sales staff. He will represent Graybar's electric housewares department in the San Jose area, which includes Santa Clara, Santa Cruz, Monterey, and Kings County.

Minneapolis-Honeywell Regulator Co appointed three men to sales positions in its Mid-Atlantic region. Edward J. Klein will be regional industrial manager with headquarters in Philadelphia. John J. Horner succeeds Klein as industrial manager of the Philadelphia branch office, and Carl. F. Boehnlein is assigned as industrial manager of the Richmond, Va., branch office.

I-T-E Circuit Breaker Co has appointed Thomas D. Williams manager of the Minneapolis district sales office: Maxwell L. Stoughton national sales specialist for the outdoor power circuit breakers manufacturer by the company's Kelman Division; and James E. Bevan manager, New York district sales office.

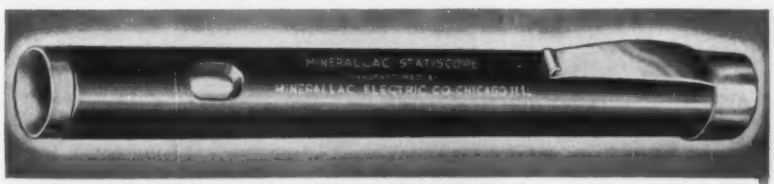
Westinghouse Electric Corp has appointed A. L. Abrahamson manager of the Indianapolis apparatus sales district. Joseph F. Noble succeeds Abrahamson as area manager of the Indianapolis district.

REPRESENTATIVES

RT&E Corp has appointed Eric Rahn sales representative for Connecticut to handle their complete line of distribution transformers and equipment.

Radio Corp of America has named representatives for five areas: J. F. Ottmar Co, Spokane, Wash., operating in northeast Oregon, northern Idaho, and western Washington; Mobile Radio Service & Communications Corp, Shreveport, La., northwest Louisiana; Miami Mobile, Inc., Miami, Fla., southern Florida; Rocky Mountain Communication Co, Inc, Denver, Colo., Colorado, Utah, Wyoming, western Kansas and western Nebraska; and Modern Electronics Laboratory Corp., Syracuse, N. Y., central New York State.

Standard Transformer Co has appointed F. C. Clatterbaugh, Omaha, Neb., and C. R. White, Cedar Rapids, Iowa, representatives in the states of Iowa and Nebraska, for the complete line of Standard Transformers covering distribution, power, dry types, and instrument transformers. The company has also named Robert W. Chapman representative for North and South Carolina.



"VOLT-TELLING" STATISCOPE protects worker

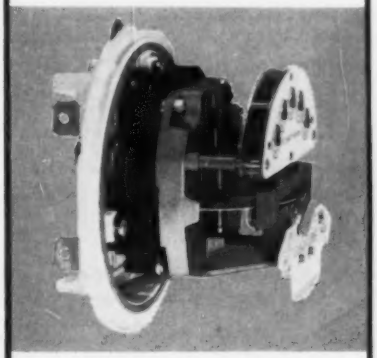
. . . when held in alternating electrical field. Indicates presence of voltage in AC and Pulsating DC Circuits and in various electrical apparatus. . . . Pocket-size illustrated above, also in Station and Overhead Extension types. Thousands in use. Order from Electrical Jobber. Send for new literature.

MINERALLAC ELECTRIC COMPANY
Manufacturers of Statiscopes, Hangers, Clips, Straps, Insulating and Cable-Pulling Compounds
25 NORTH PEORIA STREET • CHICAGO 7, ILLINOIS

METERMAN'S CHECK LIST

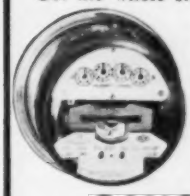
Stop a Meter Maintenance Problem... CORROSION!

The Sangamo J2 Watthour Meter has corrosion resistant construction designed to end maintenance problems caused by weather and atmospheric conditions.



The corrosion resistant finishes used on the J2 are the finest available, anywhere. But, they do change (for the better) because the search for ideal finishes is never-ending. Meters are tested under actual operating conditions in corrosive atmospheres even as Sangamo chemists develop new finishes. As a result of these tests and continuing chemical research, the corrosive resistant characteristics of the J2 meter are being improved constantly.

Get the whole story of the J2... It's told in an informative booklet titled "Meterman's Check List." Write for your copy today.



SANGAMO Electric Company
SPRINGFIELD, ILLINOIS

The Meetings Calendar

NOVEMBER

American Institute of Electrical Engineers—Appliance Technical Conference, Biltmore Hotel, Los Angeles, Calif., Nov. 16.

Canadian Electrical Association—Engineering Section, Calgary, Canada, Nov. 16-18.

Southeastern Electric Exchange—Sales Conference, Roosevelt Hotel, New Orleans, La., Nov. 16-18.

Industrial Electrical Expositions—Penn-Sheraton Hotel, Pittsburgh, Pa., Nov. 16-18.

Fifth International Automation Congress and Exposition—New York Trade Show Building, New York City, Nov. 16-20.

National Association of Corrosion Engineers—Fourth Annual General Florida Conference 1959 Corrosion Short Course, Key Biscayne Hotel, Miami, Fla., Nov. 16-20.

Sixth Annual National Electric Farm Power Conference—Sponsored by Inter-Industry Farm Electric Utilization Council, Westward Ho Hotel, Phoenix, Ariz., Nov. 18-20.

American Society of Mechanical Engineers—Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., Nov. 29-Dec. 4.

DECEMBER

Eastern Joint Computer Conference—Statler Hotel, Boston, Mass., Dec. 1-3.

American Institute of Mining, Metallurgical, and Petroleum Engineers—1959 Electric Furnace Conference, Cleveland Hotel, Cleveland, Ohio, Dec. 2-4.

Electric Companies Public Information Program—Steering Committee, Waldorf-Astoria, New York City, Dec. 8.

Second National Conference on the Application of Electrical Insulation—Sponsored by the AIEE & NEMA, Shoreham Hotel, Washington, D. C., Dec. 8-10.

JANUARY—1960

• **Industrial Heating Equipment Association**—The Warwick Hotel, Philadelphia, Pa., Jan. 18-19.

• **Pennsylvania Electric Association**—Systems Operation Committee, Philadelphia, Pa., Jan. 21-22; Structures and Hydraulics Committee and Transmission and Distribution Committee, Pittsburgh, Pa., Jan. 28-29.

• **Oklahoma Utilities Association**—Accounting Section, Tulsa, Okla., Jan. 22.

• **National Association of Corrosion Engineers**—Fifth Annual Corrosion Control Short Course, University of Houston, Houston, Texas, Jan. 22-23.

• **Hydraulic Institute**—The Homestead, Hot Springs, Va., Jan. 25-27.

• **Canadian Electrical Association** — Eastern Zone, Chateau Frontenac, Quebec. Canada, Jan. 25-28.

• **National Association of Purchasing Agents**—Public Utility Buyers Group, Mid-Winter Meeting, Atlanta Biltmore Hotel, Atlanta, Ga., Jan. 31-Feb. 1-2.

• **American Institute of Electrical Engineers**—Winter Meeting, New York City, Jan. 31-Feb. 5.

FEBRUARY

• **American Society of Heating, Refrigerating and Air-Conditioning Engineers**—Semi-Annual Meeting and Second Southwest Heating and Air-Conditioning Exposition, Dallas, Texas, February 1-4.

• **Fourth National Industrial Electric Heating Conference**—Sponsored by The Industrial Electrification Council, Netherland-Hilton Hotel, Cincinnati, Ohio, Feb. 1-4.

• **American Society for Testing Materials**—Committee Week, Hotel Sherman, Chicago, Ill., Feb. 1-5.

• **American Institute of Electrical Engineers**—Winter General Meeting, New York City, Feb. 1-5.

• **Pennsylvania Electric Association**—Electrical Equipment Committee, Harrisburg, Pa., Feb. 4-5; Joint Meeting of Relay and Communications Committee, Hotel Bellevue-Stratford, Philadelphia, Pa., Feb. 11-12.

• Additions this week.

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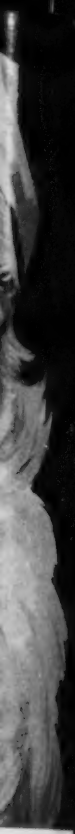
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